

MARYLAND TRAINING – 2009

IECC

RESIDENTIAL PROVISIONS



Course Overview

- **Introduction to Energy Codes**
 - State & National Goals
- **2009 IECC**
 - Residential Requirements
 - Compliance Approaches
 - New 2009 Requirements
- **Building Science Behind the Code**

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BCAP – Building Codes Assistance Project

Non-profit, based in D.C. since 1994

Formed as a joint project of the *Alliance to Save Energy*, the *Natural Resources Defense Council*, and the *American Council for an Energy Efficient Economy*

Provide *resources, education & advocacy assistance* for adoption, implementation, & advancement of effective energy codes on behalf of the US Department of Energy and other funders

SENTECH, now part of SRA



SENTECH, *Inc.*

Advanced ♦ Energy ♦ Thinking

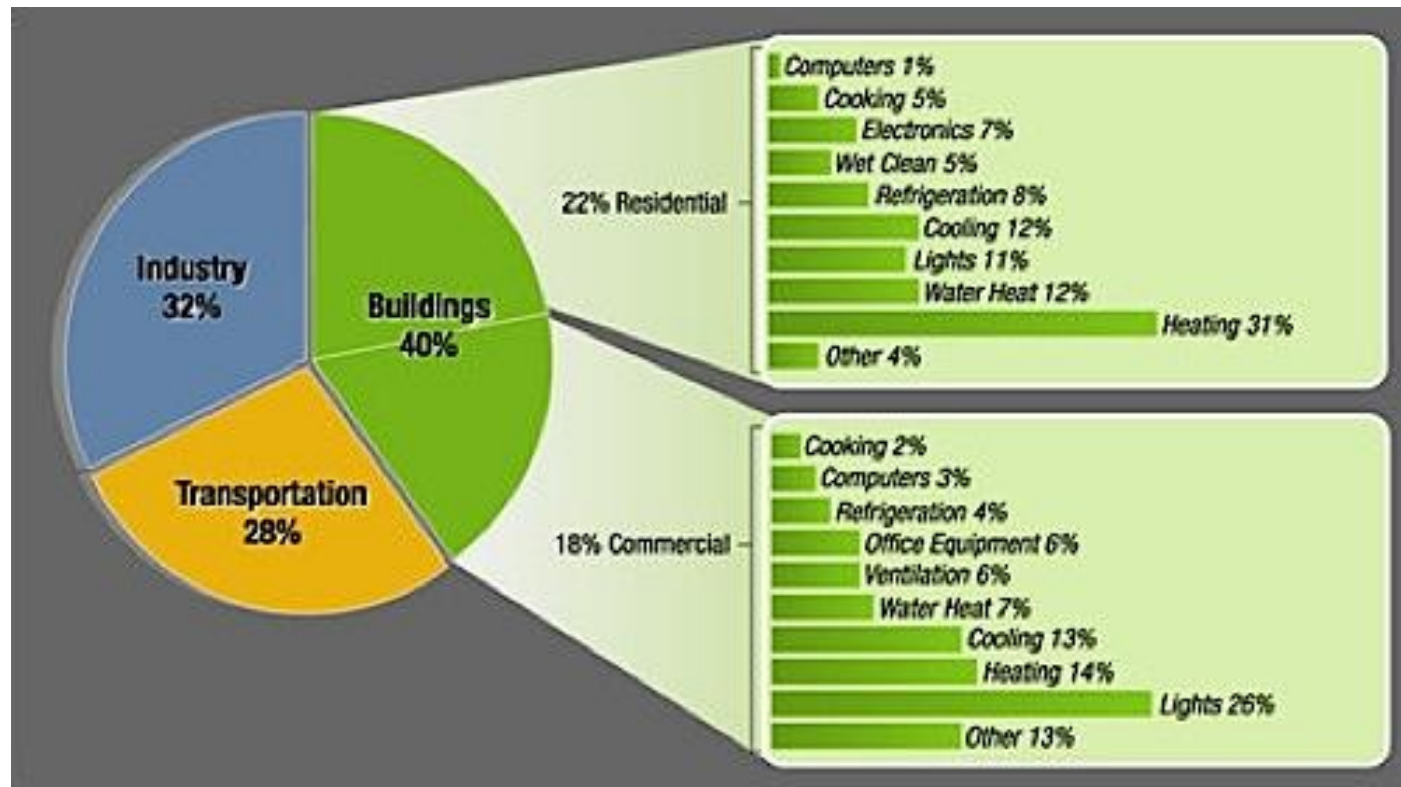
Sustainable Buildings

Combined Heat & Power ♦ Energy Storage ♦ Fuel Cells ♦ Intelligent Grid Design ♦ On-Site Generation ♦ High-Temp Superconductivity



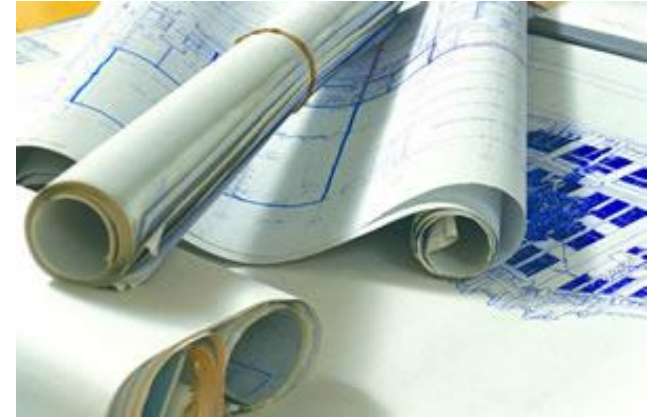
Environmental Impact of Buildings

- ~40% of total energy use in the US
- 70% of total US electricity consumption
- 40% of CO₂ emissions – on average.....



VALUE of Energy Codes

Affects ALL new buildings



By 2020:

- **23.4 million** new housing units
- Over **1 trillion** sq feet commercial floor space

By 2030:

- Over **41 million** new housing units
- Over **2 trillion** sq feet commercial floor space

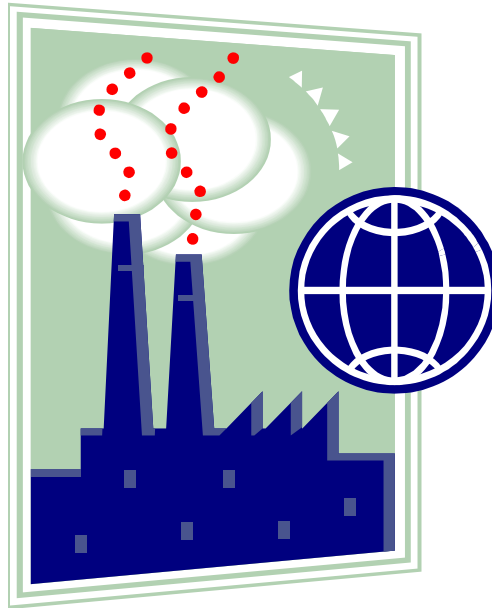
Source: EIA, Annual Energy Outlook 2008

Also...

Beyond code activities such as high performance buildings, advanced standards, and green building initiatives **prepare the market** so that it can handle more energy efficient requirements through codes.



Why do Energy Codes Matter?



Buildings are critical to addressing energy and climate issues

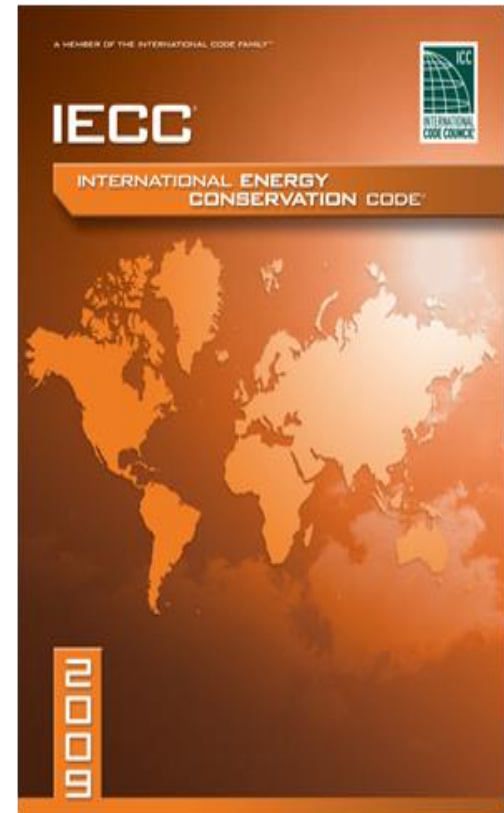
Efficient buildings

- Avoid global climate change
- Reduce foreign oil dependency
- Reduce stress on power grid and natural gas supplies
- Improve air quality and public health
- Save consumers money



What is the IECC?

A Required
Minimum Level of
Energy Efficiency
in New Residential
and Commercial
Construction



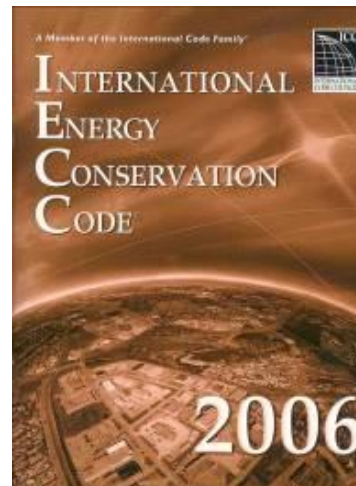
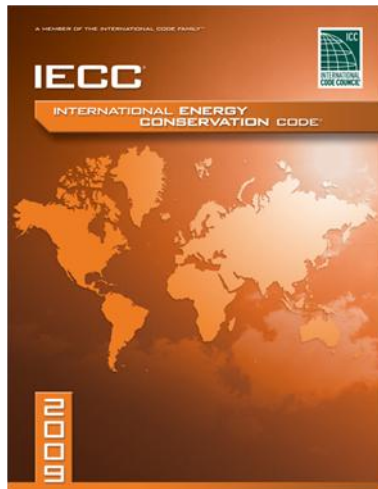
The International Family of Codes

**Coordinated
family of
International
Codes,
INCLUDING IECC**



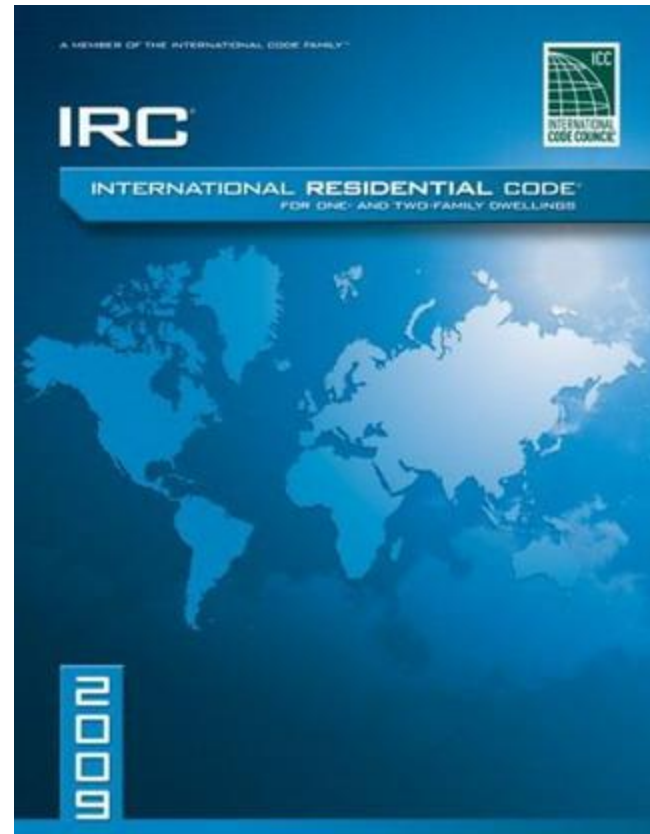
Structure of the IECC

- Chapter 1 Administrative
- Chapter 2 Definitions
- Chapter 3 Climate Zones
- Chapter 4 Residential Energy Efficiency
- Chapter 5 Commercial Energy Efficiency
- Chapter 6 Referenced Standards



IECC/IRC Interrelationship

- IECC addresses only energy
- In Maryland – IRC Chapter 11 *references* IECC for energy



Scope

Residential Buildings:

IRC only for single-family, duplex, and townhouses

IECC has all low-rise (1-3 stories) houses, condos, and apartments [R-2, R-3, R-4], but not hotels/motels [R-1]

All buildings that are not “residential” by definition are “commercial”



Maryland - 2009 IECC Overview

- Energy Code Update:
 - State Effective Date:
January 1, 2010
 - Residential Provisions and
Major Changes Covered
Today



What's Changed Since IECC 2006?

- Stringency – some key differences
- New requirements
 - Building envelope tightness inspection/testing
 - Duct testing
 - Lighting equipment
 - Pool controls and covers
 - Snow melt controls
- Moisture control requirements moved to IRC
 - Vapor Retarders
- No mechanical trade-offs allowed

New
Code
Requirements

Energy Code Requirements

Mandatory Requirements (apply to all buildings):

- Duct insulation and sealing
- Infiltration control
- Temperature controls
- Pipe insulation

Climate Specific Requirements:

- *Roofs*
- *Above grade walls*
- Skylights, windows, and doors
- *Foundations - Basements, Slabs, Crawlspaces*

Compliance



Who Must Comply?

Basic Requirements

**Insulation & Window
Requirements**

**Prescriptive
Package**

**Performance
Software**

**REScheck
Software**

Additions, Alterations, Renovations, Repairs

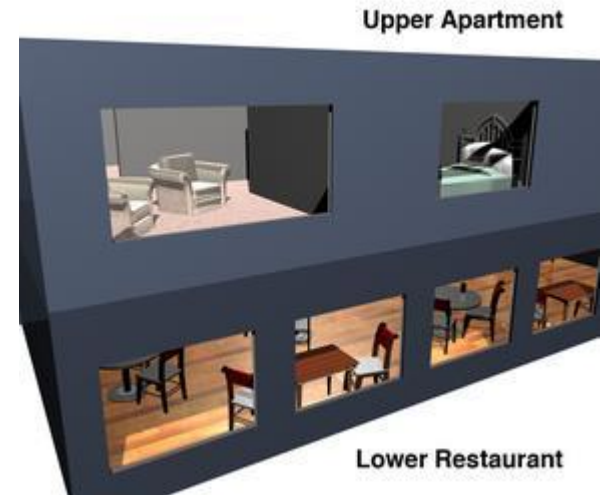
*Code
Requirements
Changes*

- Conform as relates to new construction
- Unaltered portion(s) do not need to comply
- Additions can comply alone or in combination with existing building
- Exceptions
 - Storm windows over existing fenestration
 - Glass only replacements
 - Exposed, existing ceiling, wall or floor cavities already filled with insulation
 - Where existing roof, wall or floor cavity isn't exposed
 - Reroofing for roofs where neither sheathing nor insulation exposed



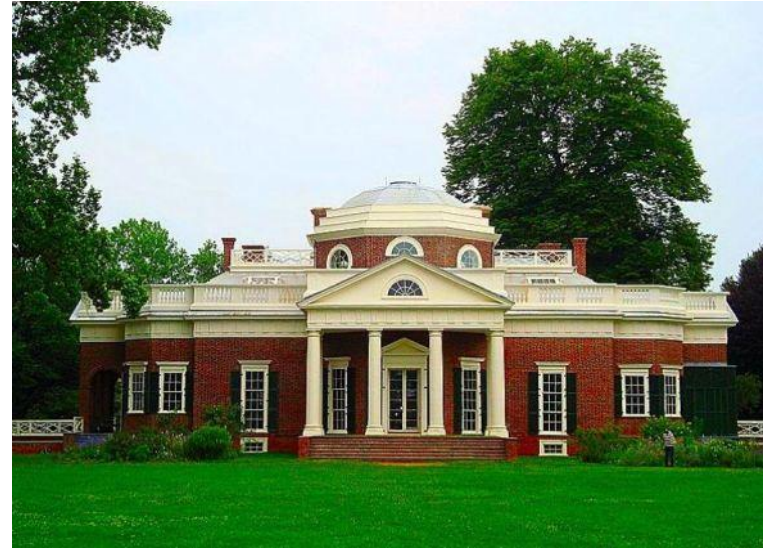
Mixed Use Buildings

- Mixed occupancies
 - Treat the residential occupancy under the applicable residential code
 - Treat the commercial occupancy under the commercial code



Exceptions

- Very low energy use buildings ($<3.4 \text{ Btu/h-ft}^2$ or 1 watt/ft^2) for space conditioning (Section 101.5.2)
- Buildings (or portions of) that are neither heated nor cooled



- Buildings designated as historic (Section 101.4.2)

What Buildings Must Comply?

- Residential buildings designated as R-2, R-3, or R-4 buildings three stories or less in height above grade.

Better Yet...

- All detached, semidetached, and attached structures, including single and multifamily structures up to three stories

Compliance



Who Must Comply?

Basic Requirements

**Insulation & Window
Requirements**

**Prescriptive
Package**

**Performance
Software**

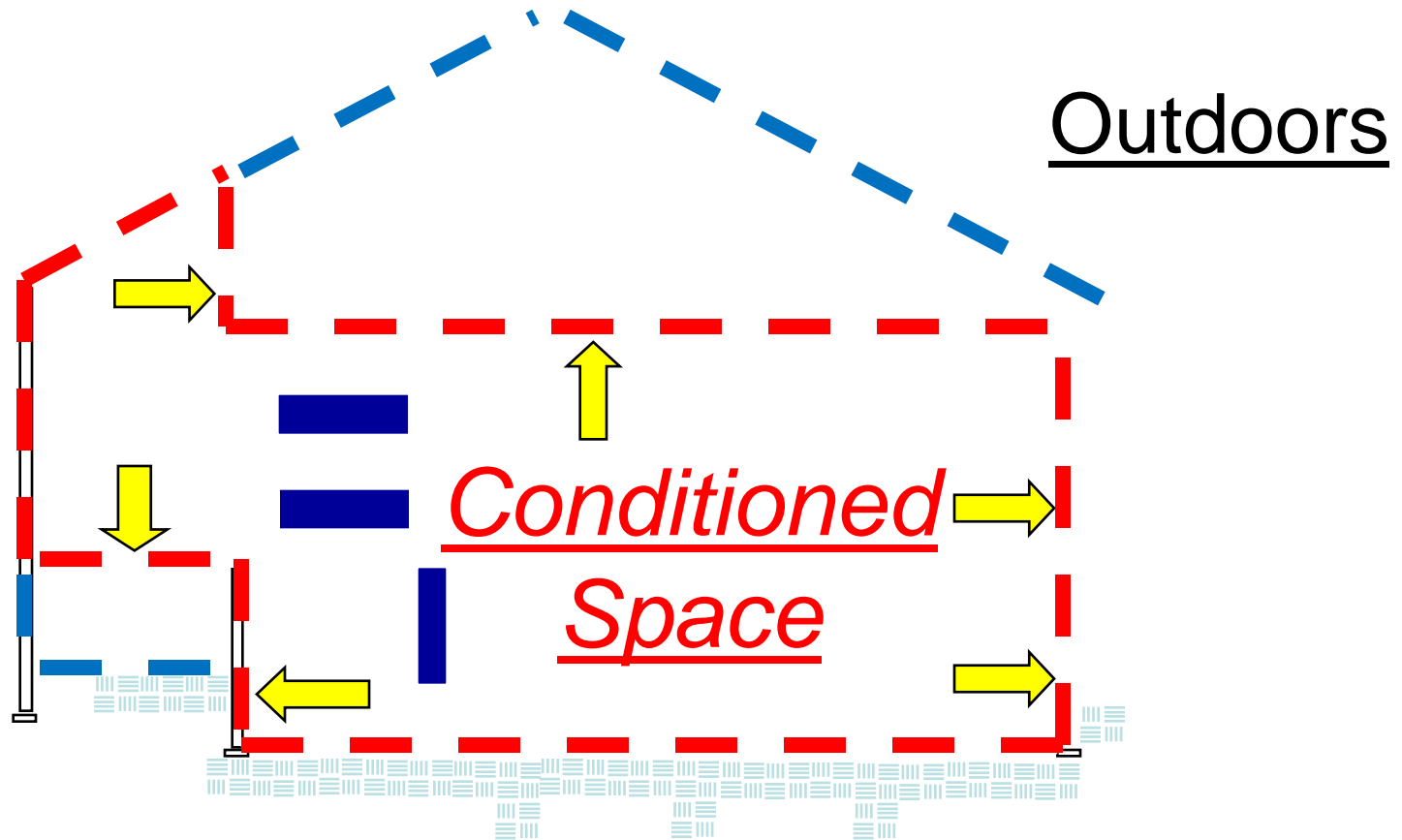
**REScheck
Software**

Conditioned Space and Building Envelope

Conditioned Space: The part of the building that is designed to be thermally conditioned for the comfort of occupants or for other occupancies or for other reasons.

Building Envelope: The area that separates conditioned space from unconditioned space or the outdoors.

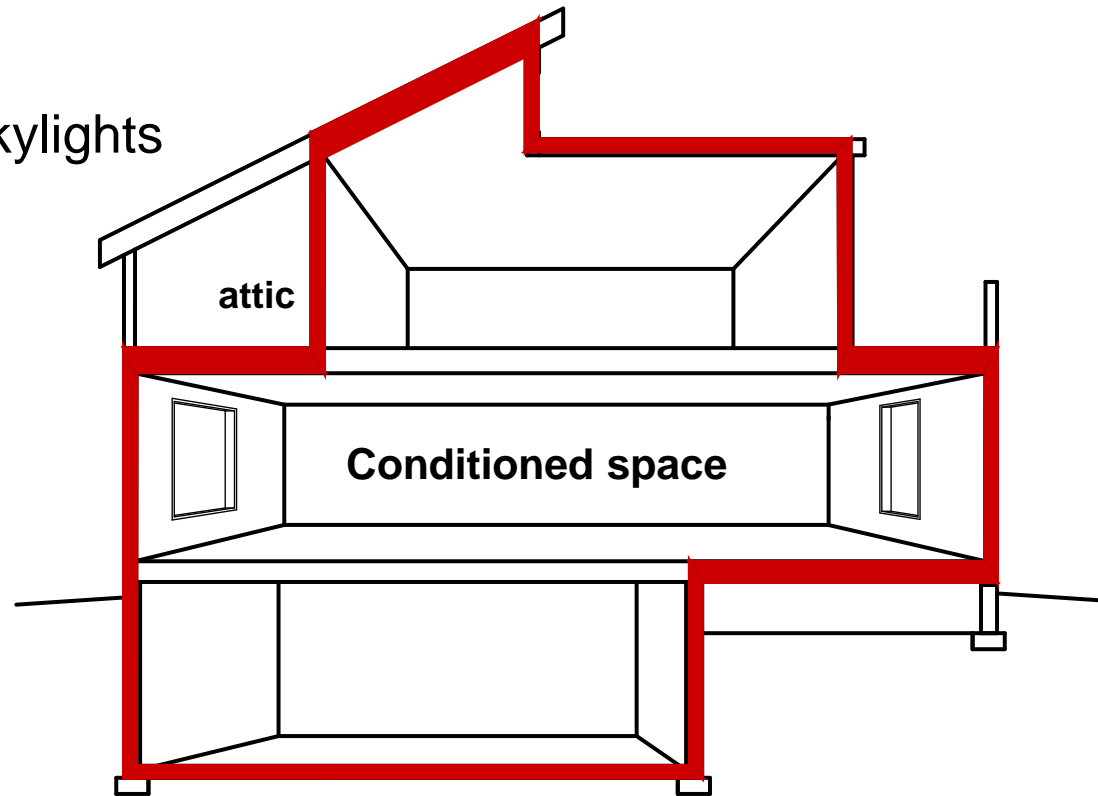
Conditioned Space/Thermal Envelope



Building Envelope Requirements

- Building Envelope consists of:

- Fenestration
 - Windows, doors, skylights
- Ceilings
- Walls
 - Above grade
 - Below grade
 - Mass walls
- Floors
- Slab
- Crawl space

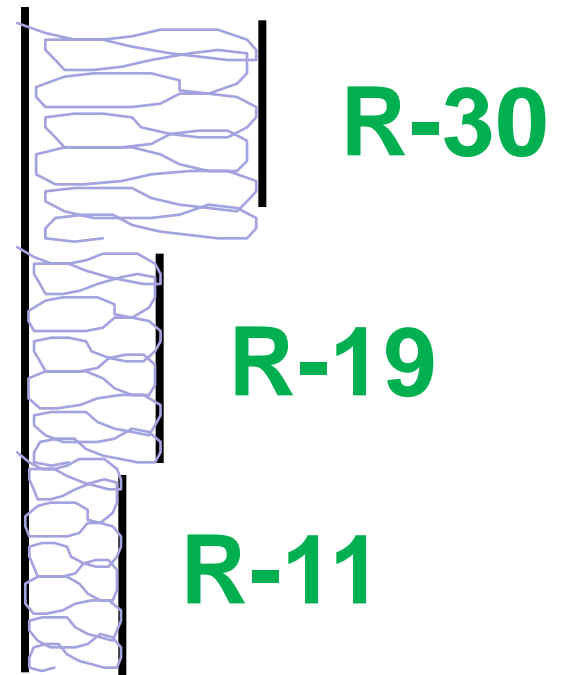


The Building Envelope Can Be Deceiving



R-Value

- Higher R-value = Better Insulated
- A Material Specification
- R-value Applies to:
 - All Walls
 - Raised Floors
 - Roofs

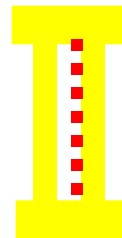


U-Factor

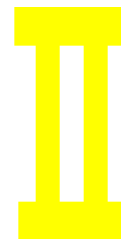
- **Lower U-factor = Better Insulated**
- **Associated with Assemblies**
- **U-factor applies to:**

- **Windows**
- **Skylights**
- **Doors**

- **$U=1/R$**
- **Includes
air films**



**Double Pane
Low-E Film
 $U \sim 0.35$**



**Double Pane
 $U \sim 0.50$**



**Single Pane
 $U \sim 1.05$**

Basic Requirements

Materials and Equipment Information

Material and Equipment throughout the building should be easily identifiable by the building inspector and homeowner. This includes R-Values, U-Factors, and equipment identification on all mechanical equipment.



Building Plans

Material Identification (303.1)

This Attic Has Been Insulated To

R-

By A Professional Insulation Contractor

The insulation in this attic was installed by a qualified professional Contractor to the R-value stated above

Certificate of Insulation

BUILDING ADDRESS:

CONTRACTOR:

Installation Date: _____


License #: _____

Area Insulated	R-Value	Installed Thickness	Settled Thickness	Installed Density	No. Bags	Sq. Ft.
Attic						
Walls						
Floors						

I, _____, (print name) certify that this residence/building has been insulated to the stated R-value and that the installation is in conformance with all applicable codes, standards, regulations and specifications.

Authorized Signature: _____ Date: _____

NFRC Window Information

	World's Best Window Co. Millennium 2000+ Vinyl-Clad Wood Frame Double Glazing • Argon Fill • Low E Product Type: Vertical Slider	
ENERGY PERFORMANCE RATINGS		
U-Factor (U.S./I-P) 0.35	Solar Heat Gain Coefficient 0.32	
ADDITIONAL PERFORMANCE RATINGS		
Visible Transmittance 0.51	Air Leakage (U.S./I-P) 0.2	
Condensation Resistance 51	—	
<small>Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product and does not warrant the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information. www.nfrc.org</small>		

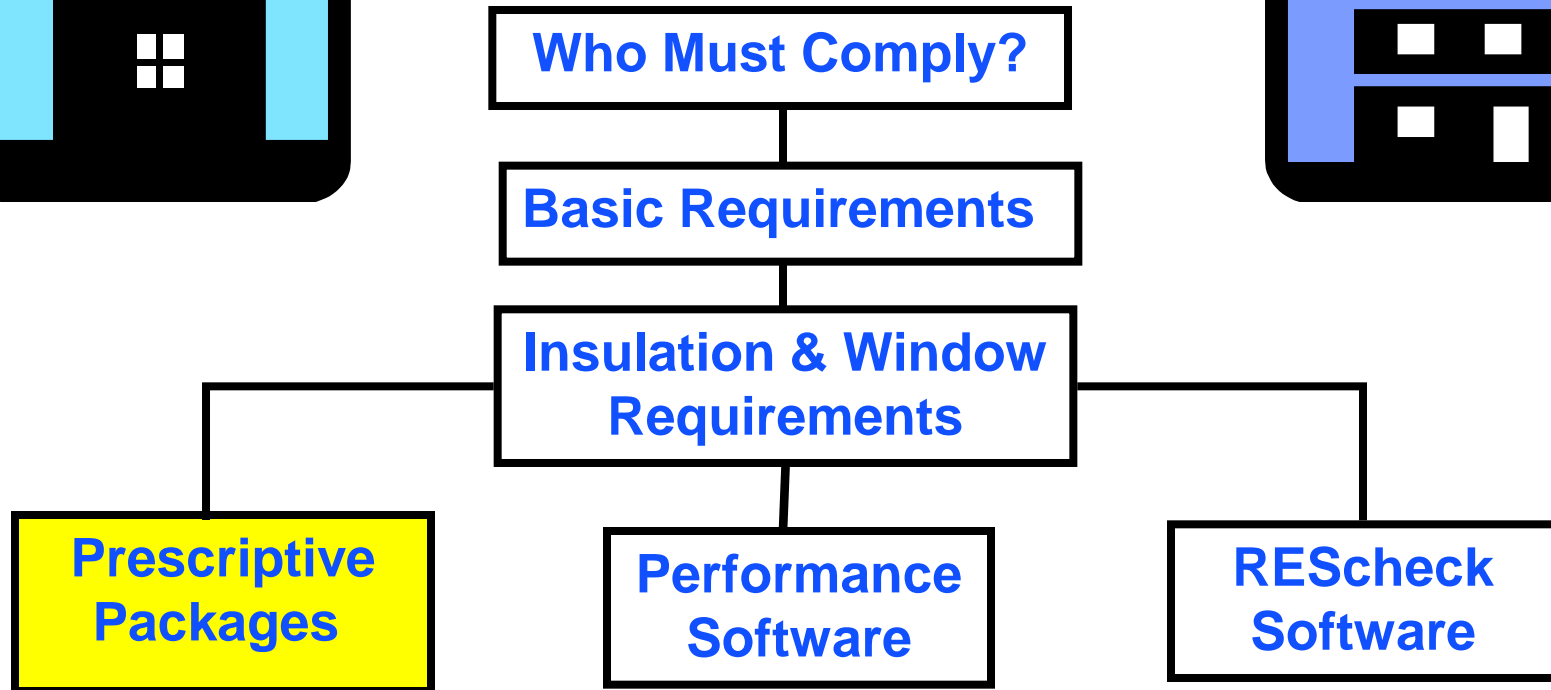
Material Identification

- Blown in attic floor insulation must have a depth marker for every 300 sq ft

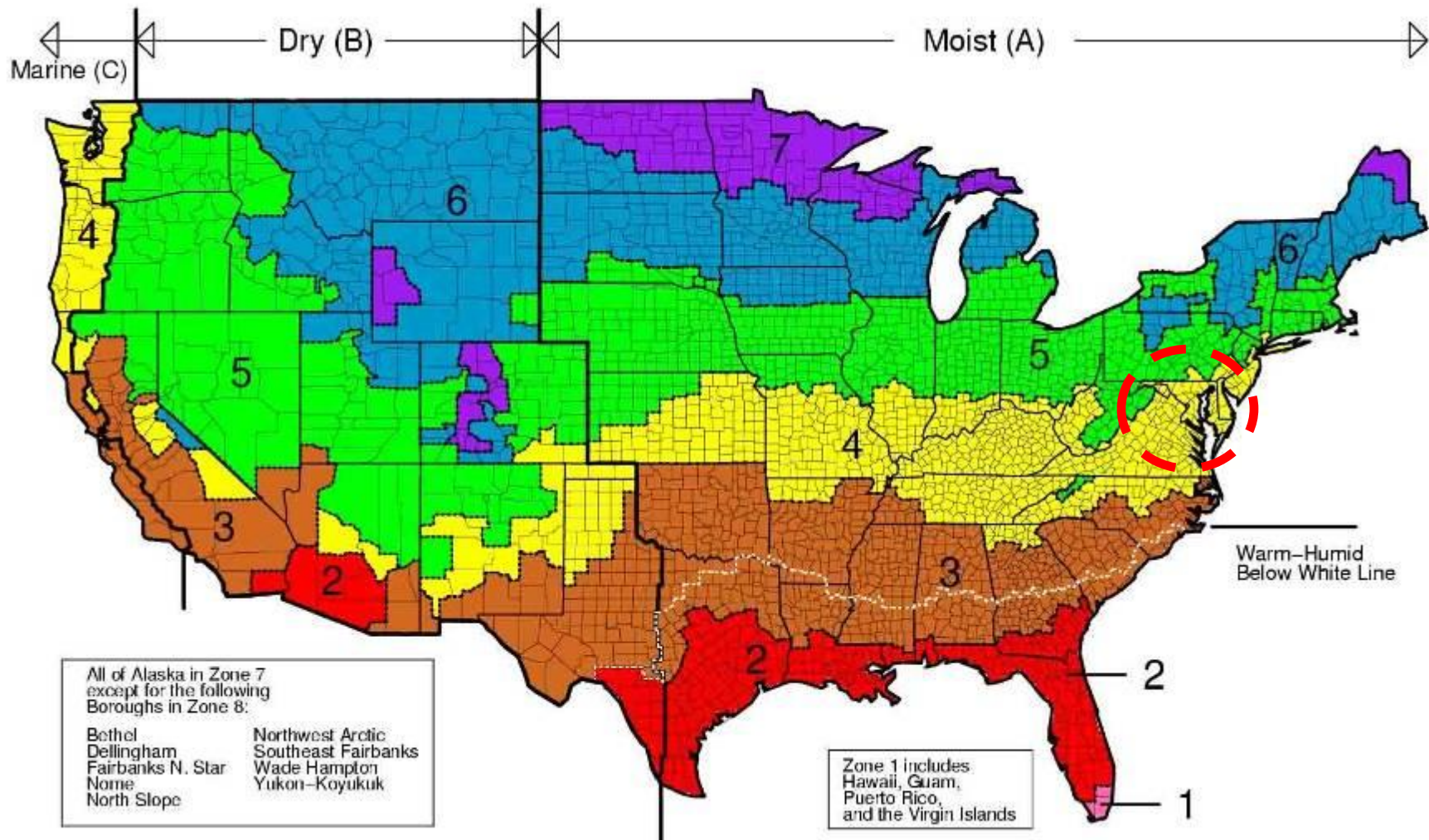


- R-value identification mark must be on all batt insulation wider than 12"

Compliance



Climate Zones—2009 IECC



**Maryland – All CZ - 4 EXCEPT
Garrett County CZ - 5**

Prescriptive Packages

- Section 402
- U-factor R-value requirements based upon:
 - Climate Zone
 - Building component (ceilings, walls, floors, windows, doors)
 - Does allow some area-weighting (windows)
 - Footnotes Key
 - No Window ft² calcs, ONE Table
- Also includes Mandatory requirements

Prescriptive Requirements

TABLE 402.1.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b, e}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ⁱ	FLOOR R-VALUE	BASEMENT ^c WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWL SPACE ^c WALL R-VALUE
1	1.2	0.75	0.30	30	13	3/4	13	0	0	0
2	0.65 ^j	0.75	0.30	30	13	4/6	13	0	0	0
3	0.50 ^j	0.65	0.30	30	13	5/8	19	5/13 ^f	0	5/13
4 except Marine	0.35	0.60	NR	38	13	5/10	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.35	0.60	NR	38	20 or 13+5 ^h	13/17	30 ^g	10/13	10, 2 ft	10/13
6	0.35	0.60	NR	49	20 or 13+5 ^h	15/19	30 ^g	15/19	10, 4 ft	10/13
7 and 8	0.35	0.60	NR	49	21	19/21	38 ^g	15/19	10, 4 ft	10/13

For SI: 1 foot = 304.8 mm.

- R*-values are minimums. *U*-factors and SHGC are maximums. R-19 batts compressed into a nominal 2 × 6 framing cavity such that the *R*-value is reduced by R-1 or more shall be marked with the compressed batt *R*-value in addition to the full thickness *R*-value.
- The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.
- "15/19" means R-15 continuous insulated sheathing on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. "15/19" shall be permitted to be met with R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulated sheathing on the interior or exterior of the home. "10/13" means R-10 continuous insulated sheathing on the interior or exterior of the home or R-13 cavity insulation at the interior of the basement wall.
- R-5 shall be added to the required slab edge *R*-values for heated slabs. Insulation depth shall be the depth of the footing or 2 feet, whichever is less in Zones 1 through 3 for heated slabs.
- There are no SHGC requirements in the Marine Zone.
- Basement wall insulation is not required in warm-humid locations as defined by Figure 301.1 and Table 301.1.
- Or insulation sufficient to fill the framing cavity, R-19 minimum.
- "13+5" means R-13 cavity insulation plus R-5 insulated sheathing. If structural sheathing covers 25 percent or less of the exterior, insulating sheathing is not required where structural sheathing is used. If structural sheathing covers more than 25 percent of exterior, structural sheathing shall be supplemented with insulated sheathing of at least R-2.
- The second *R*-value applies when more than half the insulation is on the interior of the mass wall.
- For impact rated fenestration complying with Section R301.2.1.2 of the *International Residential Code* or Section 1608.1.2 of the *International Building Code*, the maximum *U*-factor shall be 0.75 in Zone 2 and 0.65 in Zone 3.

Alternative U-Factor

TABLE 402.1.3
EQUIVALENT *U*-FACTORS^a

CLIMATE ZONE	FENESTRATION <i>U</i> -FACTOR	SKYLIGHT <i>U</i> -FACTOR	CEILING <i>U</i> -FACTOR	FRAME WALL <i>U</i> -FACTOR	MASS WALL <i>U</i> -FACTOR ^b	FLOOR <i>U</i> -FACTOR	BASEMENT WALL <i>U</i> -FACTOR	CRAWL SPACE WALL <i>U</i> -FACTOR ^c
1	1.20	0.75	0.035	0.082	0.197	0.064	0.360	0.477
2	0.65	0.75	0.035	0.082	0.165	0.064	0.360	0.477
3	0.50	0.65	0.035	0.082	0.141	0.047	0.091 ^c	0.136
4 except Marine	0.35	0.60	0.030	0.082	0.141	0.047	0.059	0.065
5 and Marine 4	0.35	0.60	0.030	0.057	0.082	0.033	0.059	0.065
6	0.35	0.60	0.026	0.057	0.060	0.033	0.050	0.065
7 and 8	0.35	0.60	0.026	0.057	0.057	0.028	0.050	0.065

a. Nonfenestration *U*-factors shall be obtained from measurement, calculation or an approved source.

b. When more than half the insulation is on the interior, the mass wall *U*-factors shall be a maximum of 0.17 in Zone 1, 0.14 in Zone 2, 0.12 in Zone 3, 0.10 in Zone 4 except Marine, and the same as the frame wall *U*-factor in Marine Zone 4 and Zones 5 through 8.

c. Basement wall *U*-factor of 0.360 in warm-humid locations as defined by Figure 301.1 and Table 301.2.

Prescriptive Exemptions

- Glass- 15ft²
- Single side hinged door < 24ft²
- Attic insulation when full height over exterior walls-

R-38 → R-30

R-49 → R-38

- Attic insulation with undersized rafters

R-30 acceptable as long as:

<500ft²

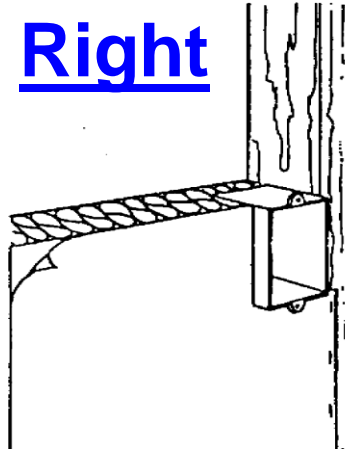
<20% of total roof area

Insulation Installation

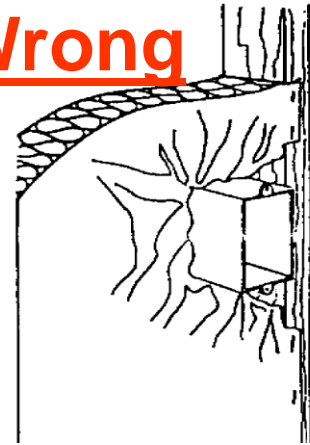
“Cut-To-Fit!”

For Wiring

Right

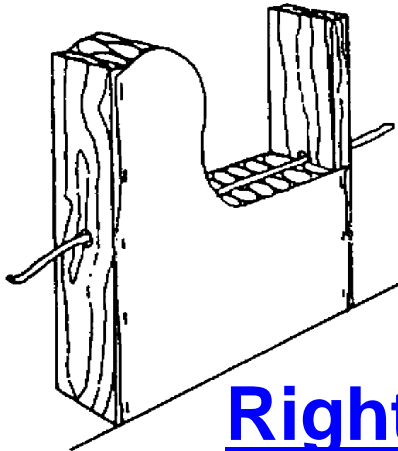


Wrong

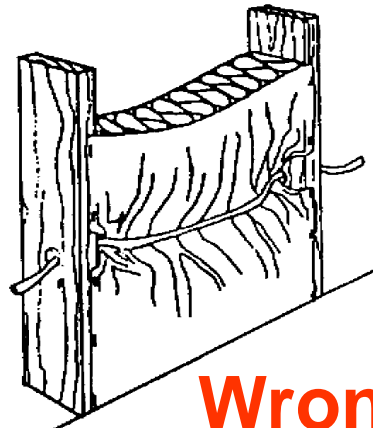


Electrical Boxes

Right



Wrong



Insulation Installation



Insulation Installation



Insulation Installation

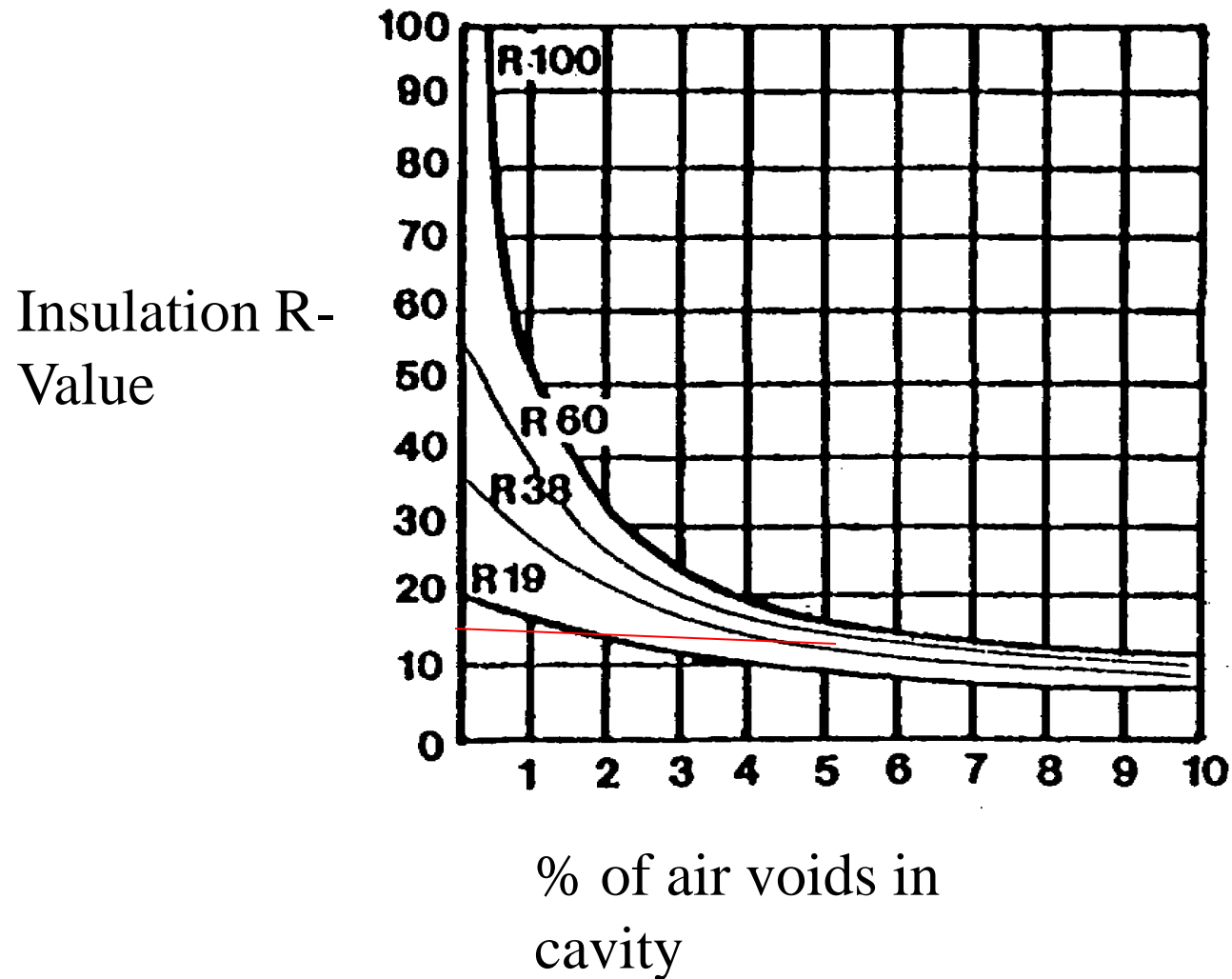


Insulation Installation

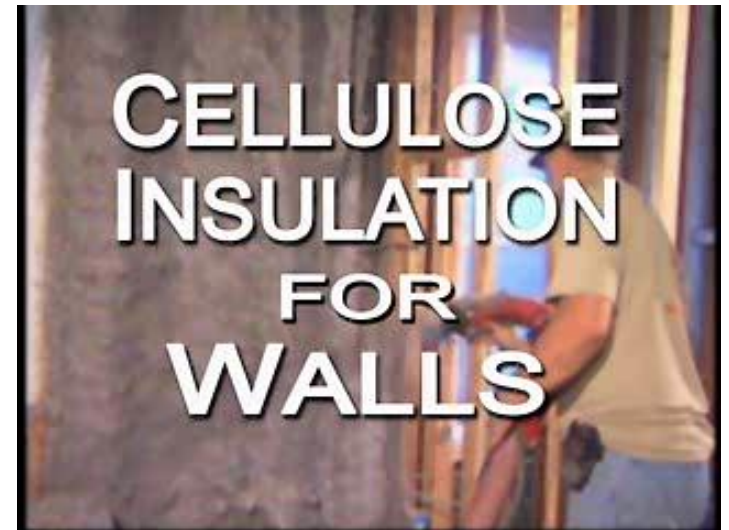
NO GAPS!



Insulation Voids



Insulation Installation



Knee Wall Insulation



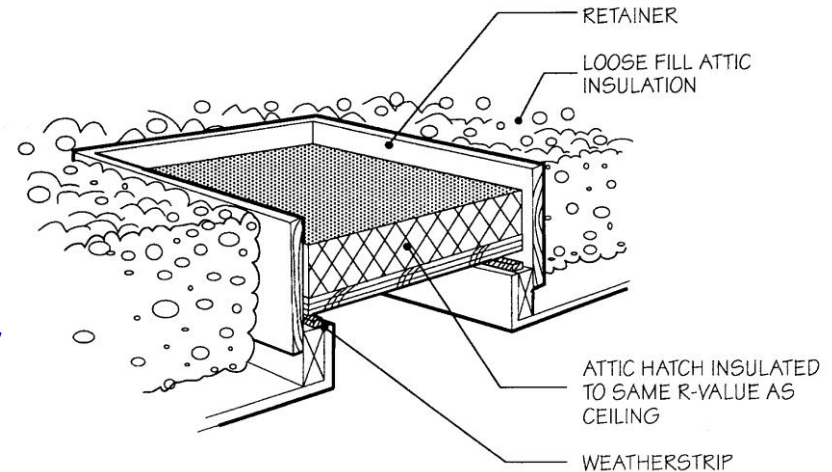
Attic Insulation



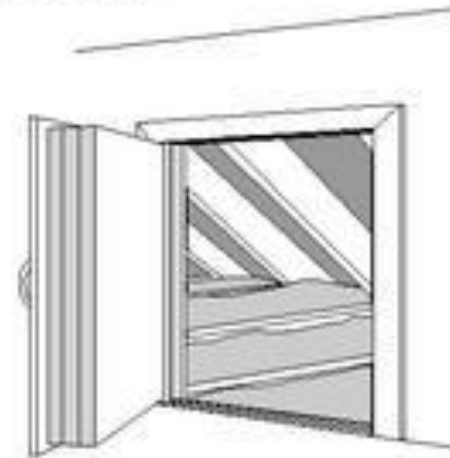
Attic Hatches Change

Section 402.2.3

- Attic Hatches
 - Air Sealed
 - Same Insulation level as floor around them
- Vertical “Hatches” (Kneewalls)
 - Also Air Sealed and insulation equal to WALL insulation level.
- Buildable?



Knee wall door



Add R-value to the knee-wall door, by adhering rigid insulation board (sandwiched together with construction adhesive and screws) to the back of the door. The clearance between the insulation and the door frame as well as air sealing details will require special attention.

Fenestration- Definition

Skylights, roof windows, vertical windows, opaque doors, glazed block and combination opaque/glazed doors.



Windows, Glazed Doors and Skylights

U-factor Requirements:

- *Rating for all Manufactured Fenestration; or*
- *Tables 303.1.3 (1-3): U-factor Default Tables for Windows, Doors and Skylights*

	World's Best Window Co. Millennium 2000+ Vinyl-Clad Wood Frame Double Glazing • Argon Fill • Low E Product Type: Vertical Slider
ENERGY PERFORMANCE RATINGS	
U-Factor (U.S./I-P) 0.35	Solar Heat Gain Coefficient 0.32
ADDITIONAL PERFORMANCE RATINGS	
Visible Transmittance 0.51	Air Leakage (U.S./I-P) 0.2
Condensation Resistance 51	—
<small>Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole-product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product and does not warrant the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information. www.nfrc.org</small>	

Fenestration (Windows, Doors)

- An area weighted average of fenestration can be used to satisfy the U-factor requirements
 - Area-weighted average U-factor is subject to hard limits, even in trade-offs
 - NFRC rated and certified
- Window replacement must meet Table 402.1.1

Windows – U-Factors

- Strict limits on U-factor in northern U.S. (cannot be traded off)

Climate Zones	U-Factor Maximum
4-5	0.48
6-8	0.40

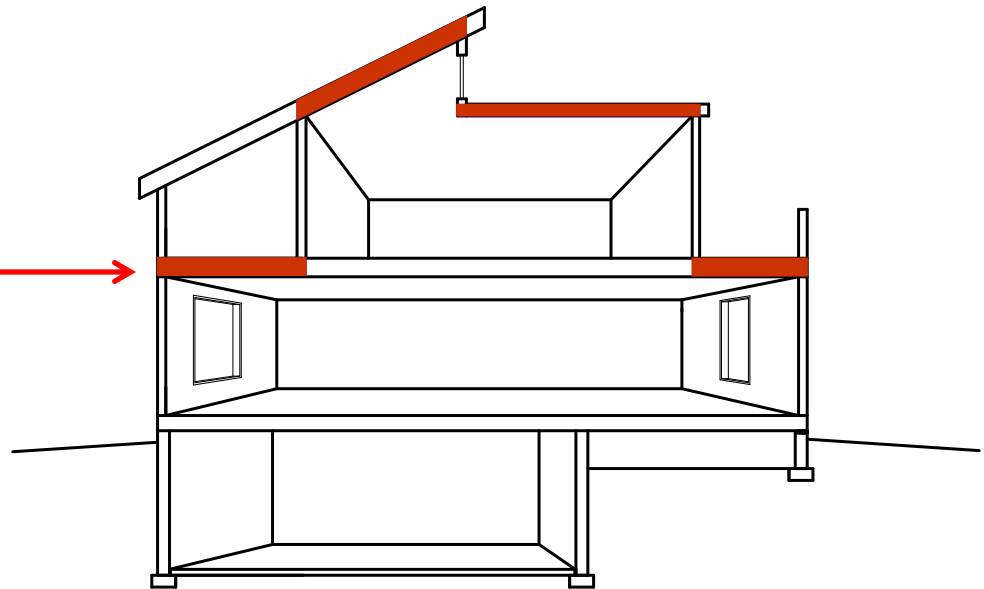
- U-0.75 for skylights in Zones 4-8
- These are based on building average; individual windows or skylights can be worse if area-weighted average meets these requirements
- Impacts the REScheck and Performance Paths

Roofs

- R- Value Requirements based on insulation framing between or above cavity
- Meet or exceed R-values

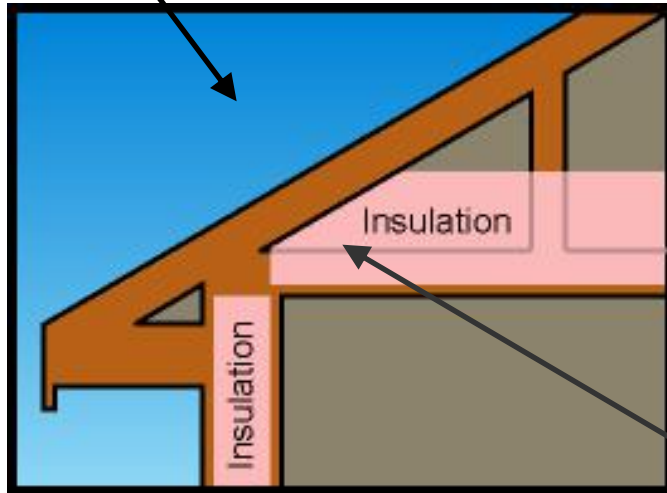


Easy to miss...



Standard Roof Truss

Potential for ice dam formations



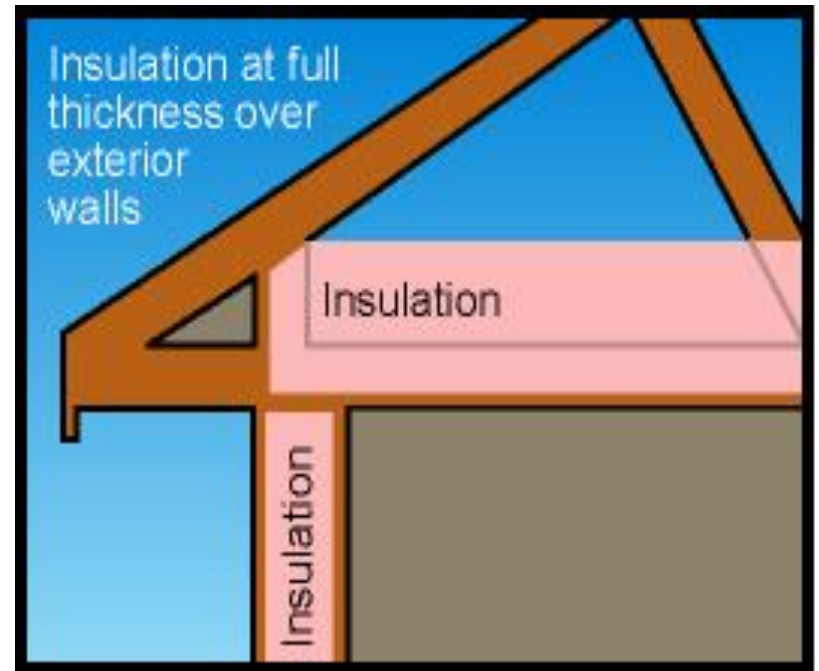
- Ceiling insulation code requirements assume standard truss systems

Cold corners contribute to condensation and mold growth

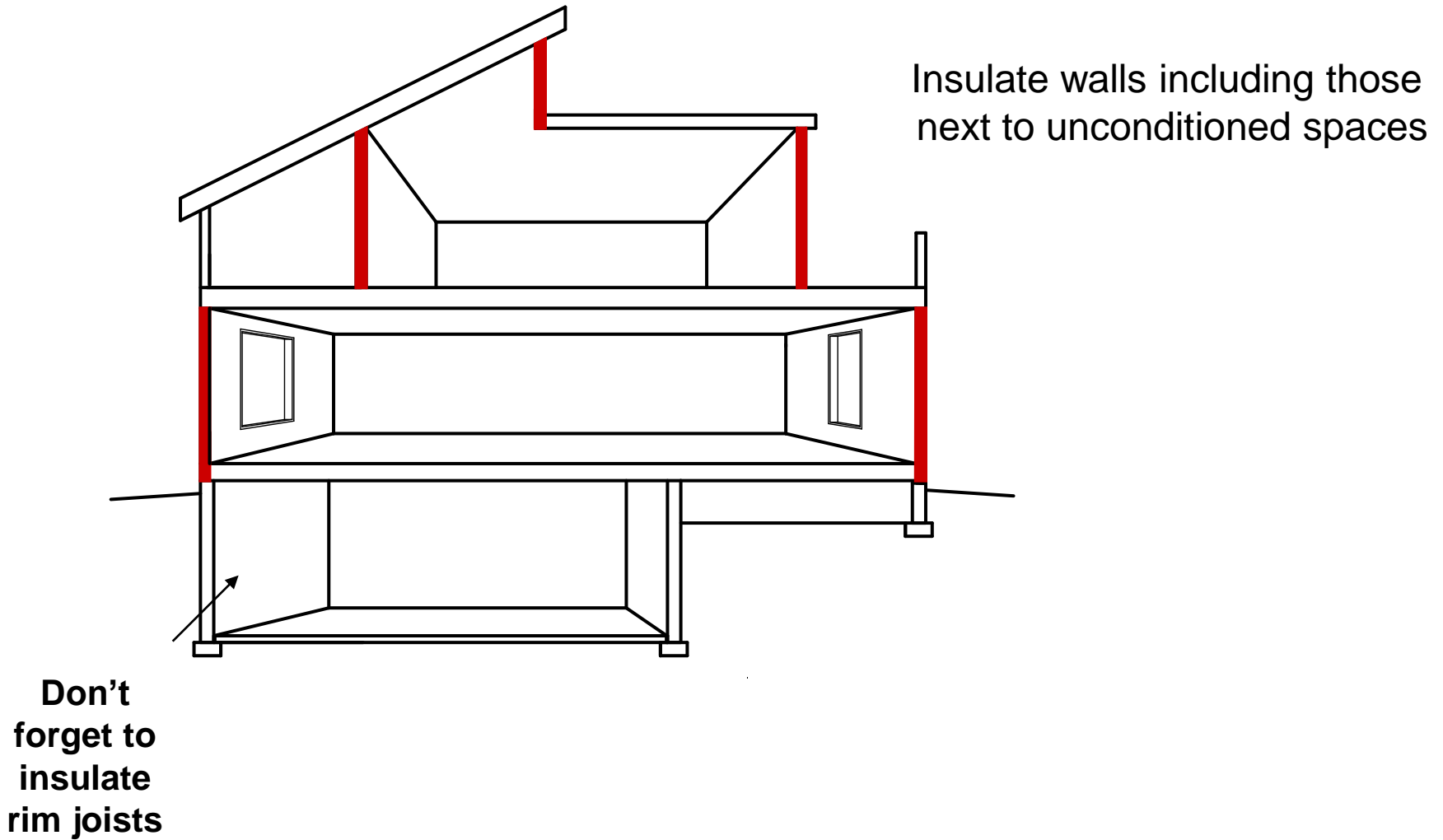
Raised Heel Truss



- Raised Heel/Energy Truss credit if insulation is full height over exterior wall



Above Grade Walls



Mass Wall Insulation

- What type
 - Concrete block, concrete, insulated concrete form (ICF), masonry cavity, brick (other than brick veneer), earth, and solid timber/logs
- Provisions
 - If 50% or more of the insulation R-value is on the exterior or integral to the wall, the smaller R-value can be used

R- 13 for Climate Zone 5

R- 5 for Climate Zone 4

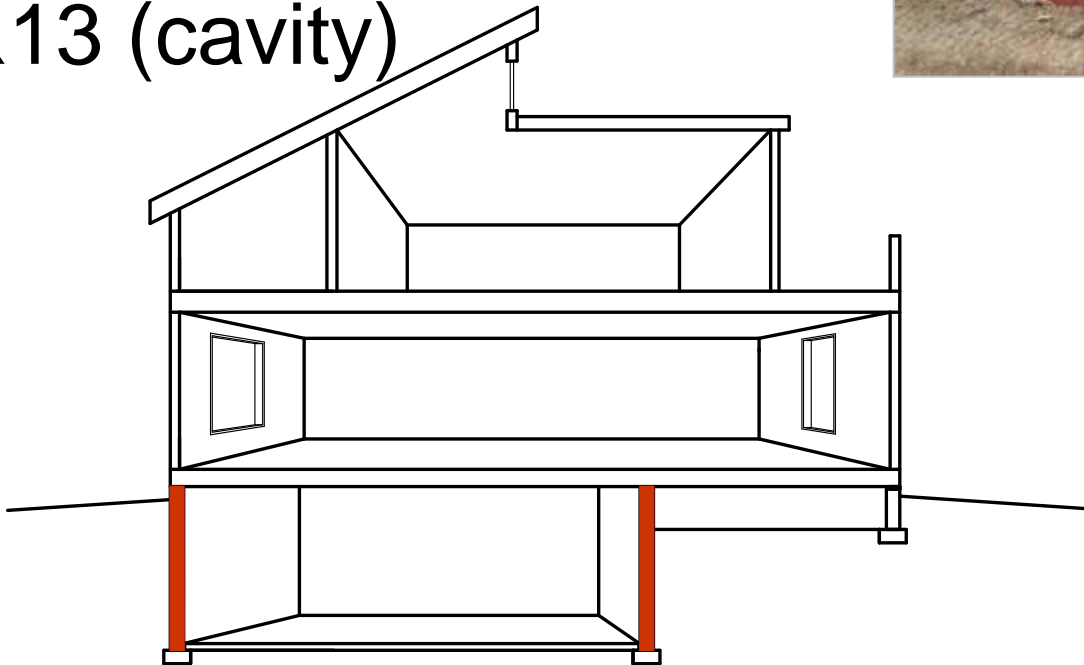
Wood Frame R-value	Cold-Formed Steel Equivalent R-value
Steel Truss Ceilings	
R-30	R-38 or R-30 + 3 or R-26 + 5
R-38	R-49 or R-38 + 3
R-49	R-38 + 5
Steel Joist Ceilings	
R-30	R-38 in 2x4, 2x6, or 2x8 R-49 any framing
R-38	R-49 2x4, 2x6, 2x8, or 2x10
Steel Framed Wall	
R-13	R-13 +5 or R-15 +4, or R-21 +3
R-19	R-13 + 9 or R-19 +8 or R-25 +7
R-21	R-13 +10 or R-19 +9 or R-25 +8
Steel Joist Floor	
R-13	R-19, 2x6 R-19 +6 in 2x8 or 2x10
R-19	R-19 +6, 2x6 R-19 +12 in 2x8 or 2x10

Steel-frame Equivalency Tables

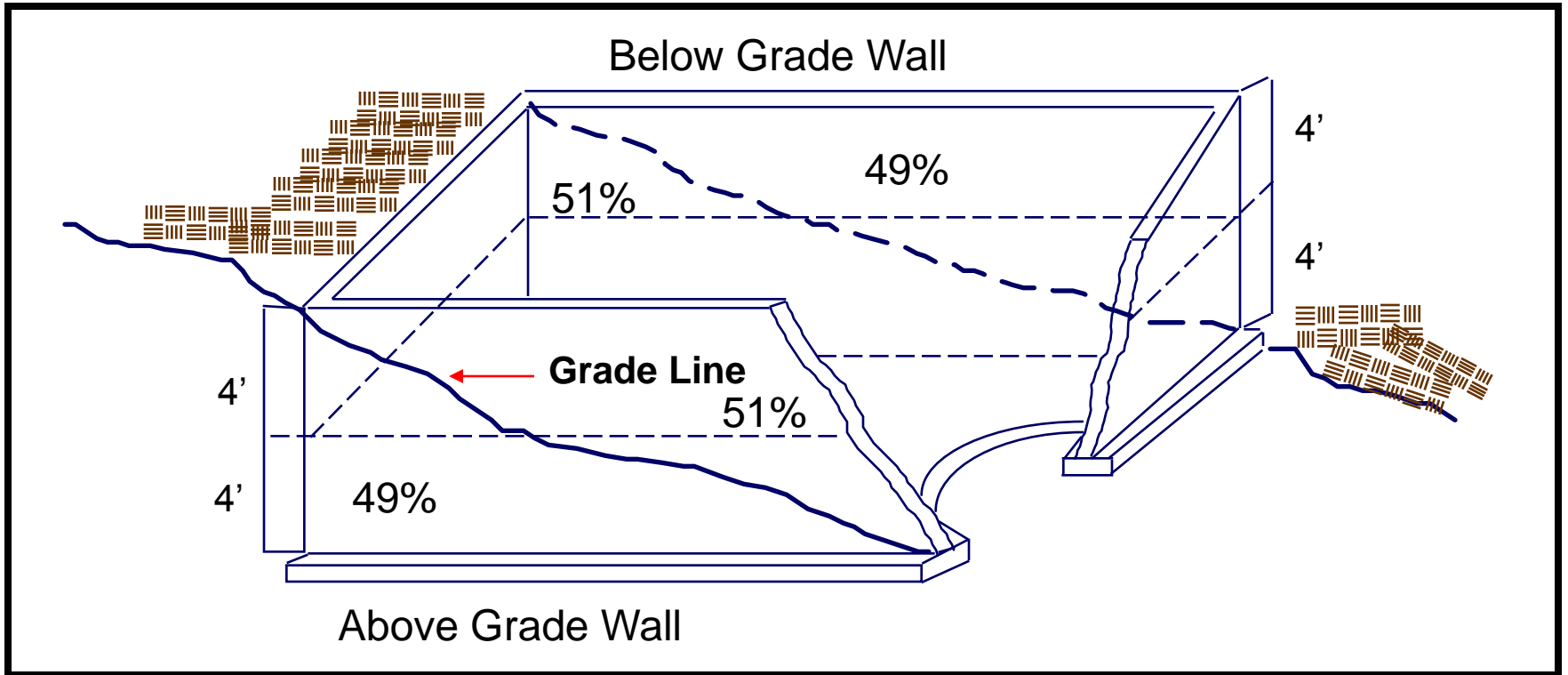
New Definitions

Below-Grade Walls

- > 50% below grade
- Zones 4 & 5: R10 (continuous) or R13 (cavity)



Basement Walls



Above Grade per Basement Wall Definition

Basement Walls

Interior Studding

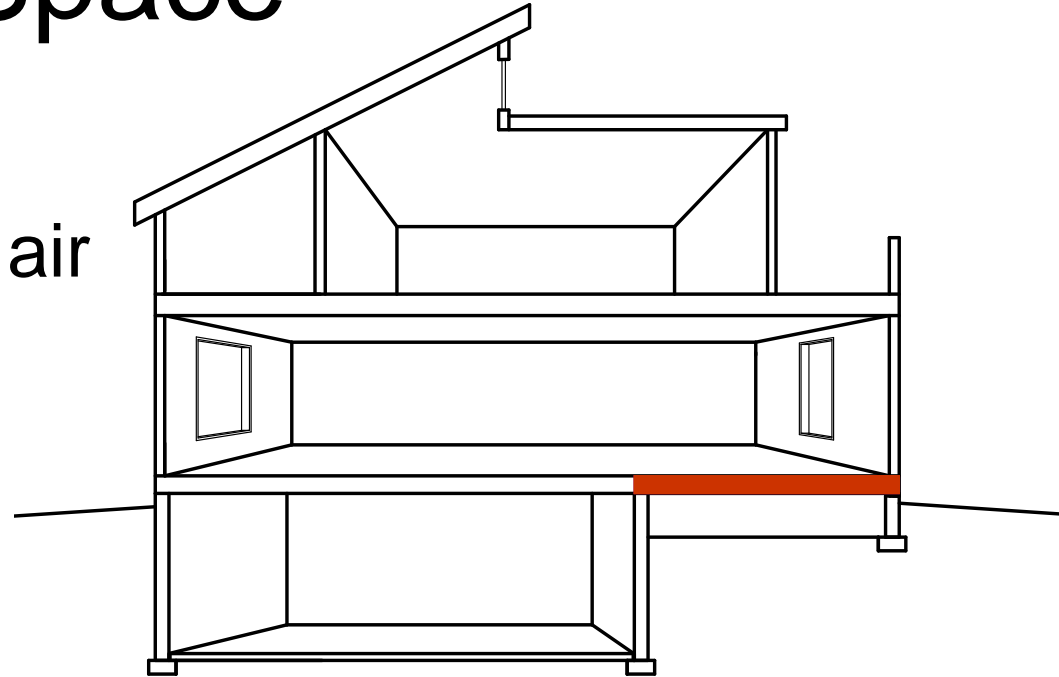


Exterior Foam



Floors over Unconditioned Space

- Space can be an unheated basement, a crawlspace or outdoor air
- Zone 4: R19
- Zone 5: R30
- R-19 either if joist size limits



- Insulation must maintain permanent contact with underside of subfloor



Crawlspaces



Crawl Space Wall Insulation

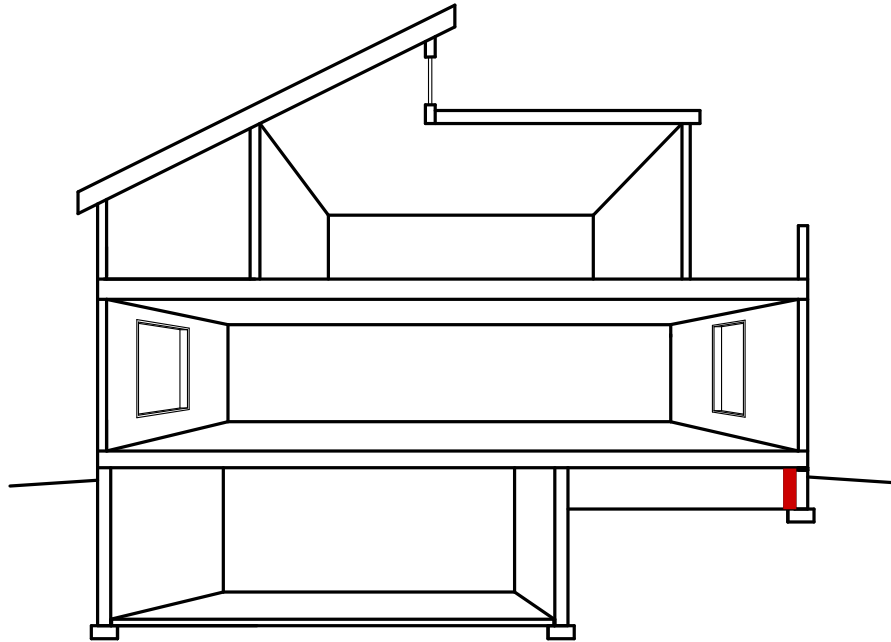
Crawl Wall Insulation: This practice eliminates the need for insulation in the raised floor above the crawl.

- ✓ Crawl space may not have ventilation openings to the outside
- ✓ Must be mechanically ventilated or supplied with conditioned air (1cfm/50 sq.ft)
- ✓ Crawl floor must be covered with an approved vapor retarder material

Crawlspace Wall Insulation

When crawlspace walls are insulated, foundation vents are not required. Space should be mechanically vented or conditioned.

R-10/13 like Basement



Crawl Space Wall Insulation



Is This a Good Idea?

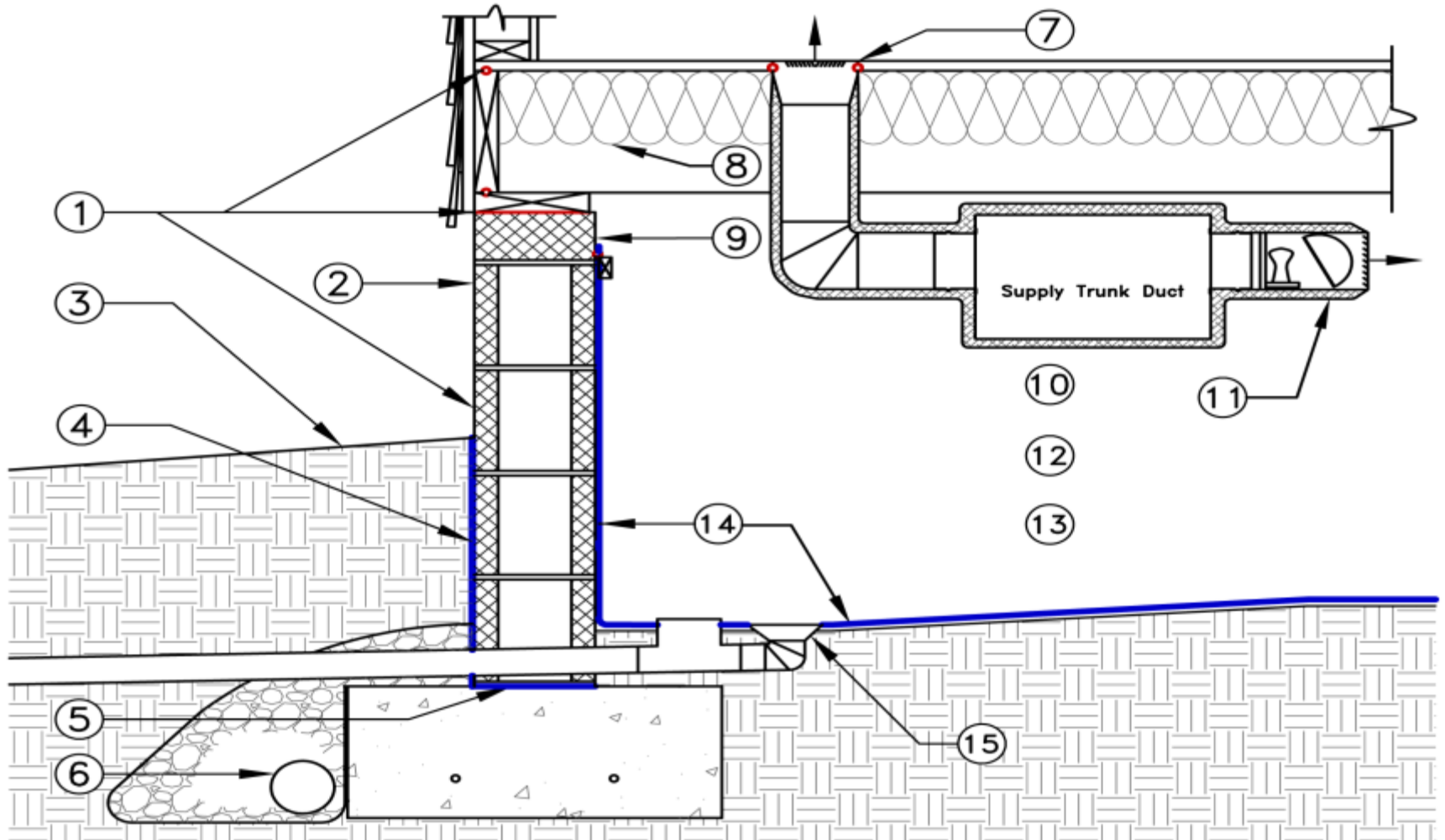


Are vents helping?



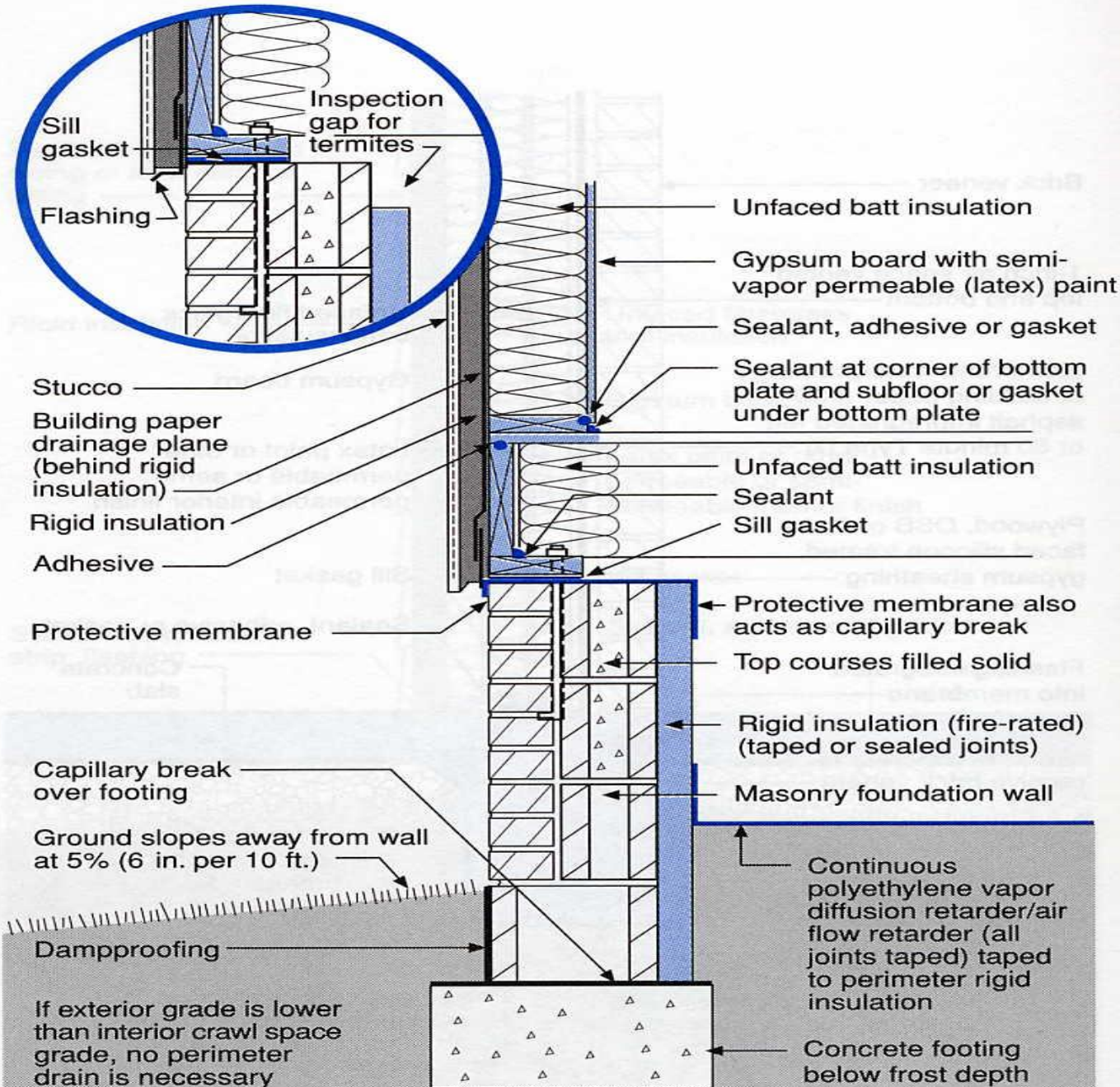
Crawlspaces To Vent, or NOT to Vent

Best Practice



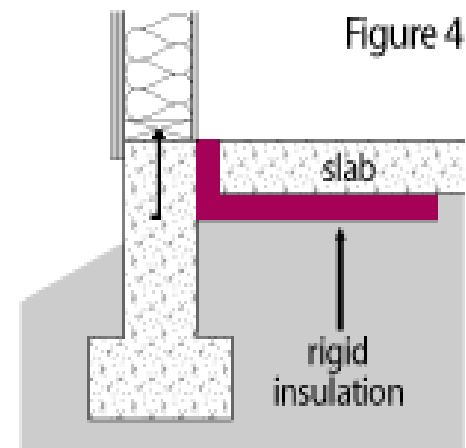
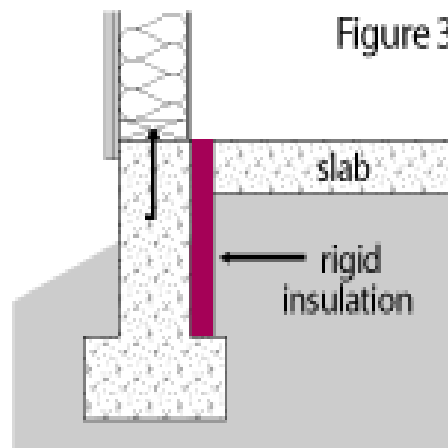
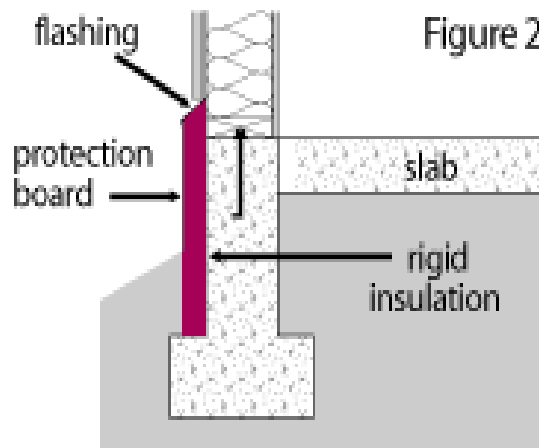
Not To Scale

Alternative Detail

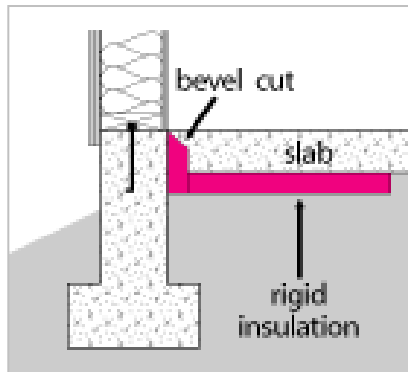


Slab Edge Insulation

- **R-10** (typically 2 inches) insulation in Zone 4, 5
- Downward from top of slab a minimum of 24"
- Insulation can be vertical or extend horizontally under the slab or out from the building (must be under 10 inches of soil),
- Can be angled at edge of slab



Slab Edge Insulation



Sunrooms

Changed
Code
Requirements

Less stringent insulation
R-value and glazing
U-factor requirements

Sunroom definition:

- Glazing area $>40\%$ glazing of gross exterior wall and roof area
- Separate heating or cooling system or zone
- Must be thermally isolated (closeable doors or windows to the rest of the house)

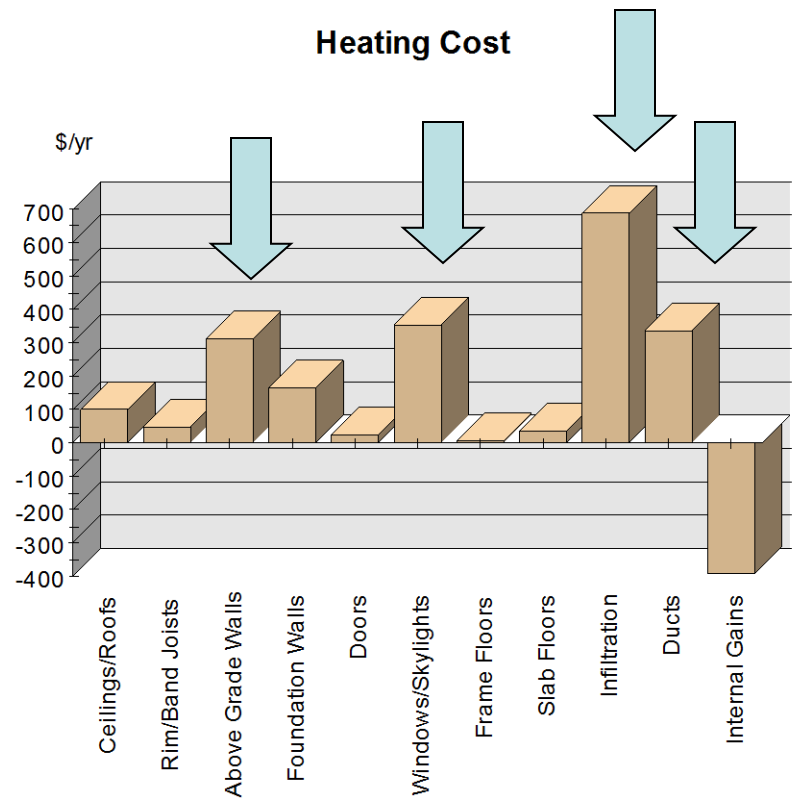
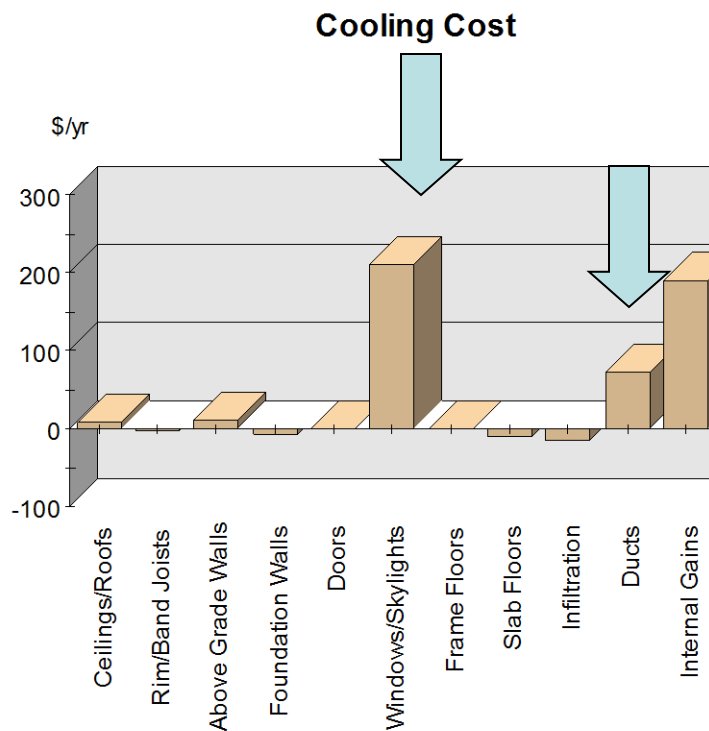


Sunroom Requirements

- Ceiling Insulation
 - Zones 4,5 R-19
- Fenestration Maximum U-Factor
 - Zone 4,5 0.50
- Wall Insulation
 - Zone 4,5 R-13
- Skylight Maximum U-Factor
 - Zone 4,5 0.75

New walls and new windows and doors separating a sunroom from the Conditioned space must meet the thermal envelope requirements.

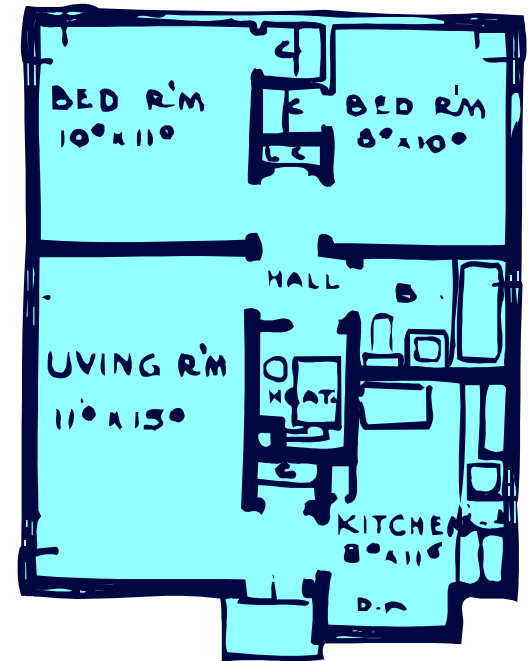
Where Is Energy Lost?



Basic Requirements

Air Leakage

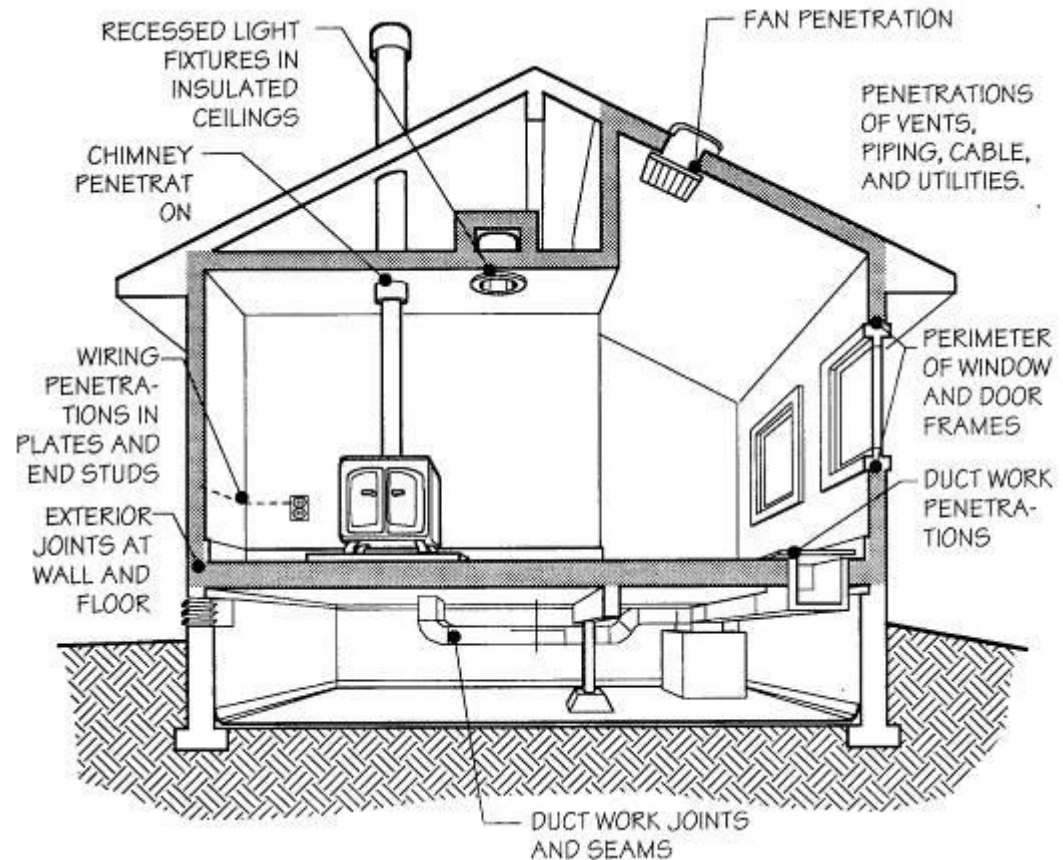
Air leakage, or infiltration, occurs when outside air enters a house uncontrollably through cracks and openings. Properly air sealing such cracks and openings in your home can significantly reduce heating and cooling costs, improve building durability, and create a healthier indoor environment.



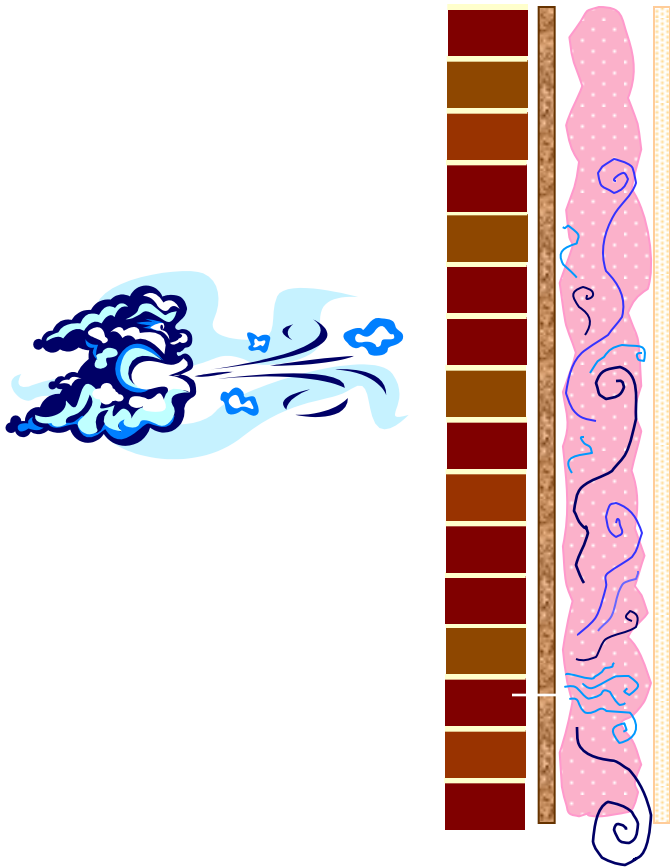
Building Plans

Areas for Air Leakage (Infiltration)

- Windows and doors
- Between sole plates
- Floors and exterior wall panels
- Plumbing
- Electrical
- Service access doors or hatches
- Recessed lightfixtures
- *Access hatches and doors*

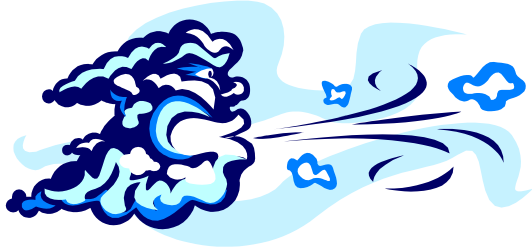


Air Leakage



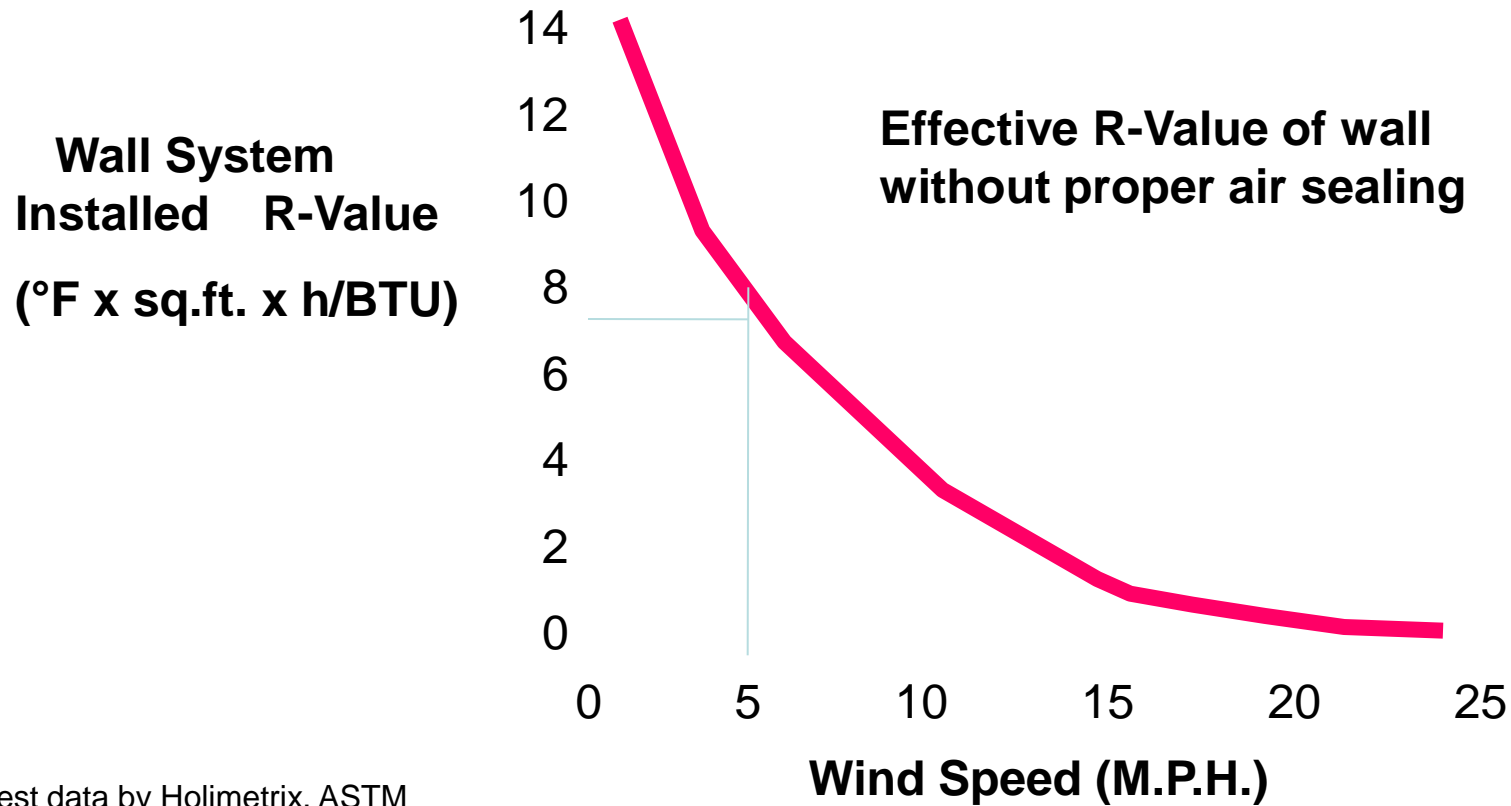
Windwashing- air movement within the wall cavity that **reduces** the installed R-value.

Air Leakage



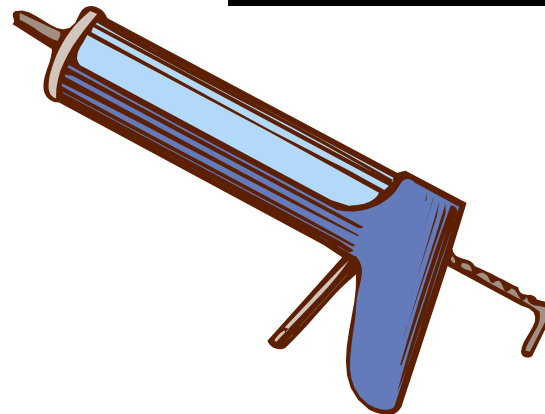
- Effects of Windwashing
 - Reduces insulation's effectiveness/installed R-value
 - Reduces overall comfort
 - Places unnecessary stress on HVAC system
 - Increases energy consumption
 - Introduces moisture to unwanted areas
 - Can cause building/space depressurization, backdrafting

Effect of Wind on Installed R-Value



*Test data by Holimetrix. ASTM
E283,ASTM E1424,C976

Infiltration Control



Infiltration Control

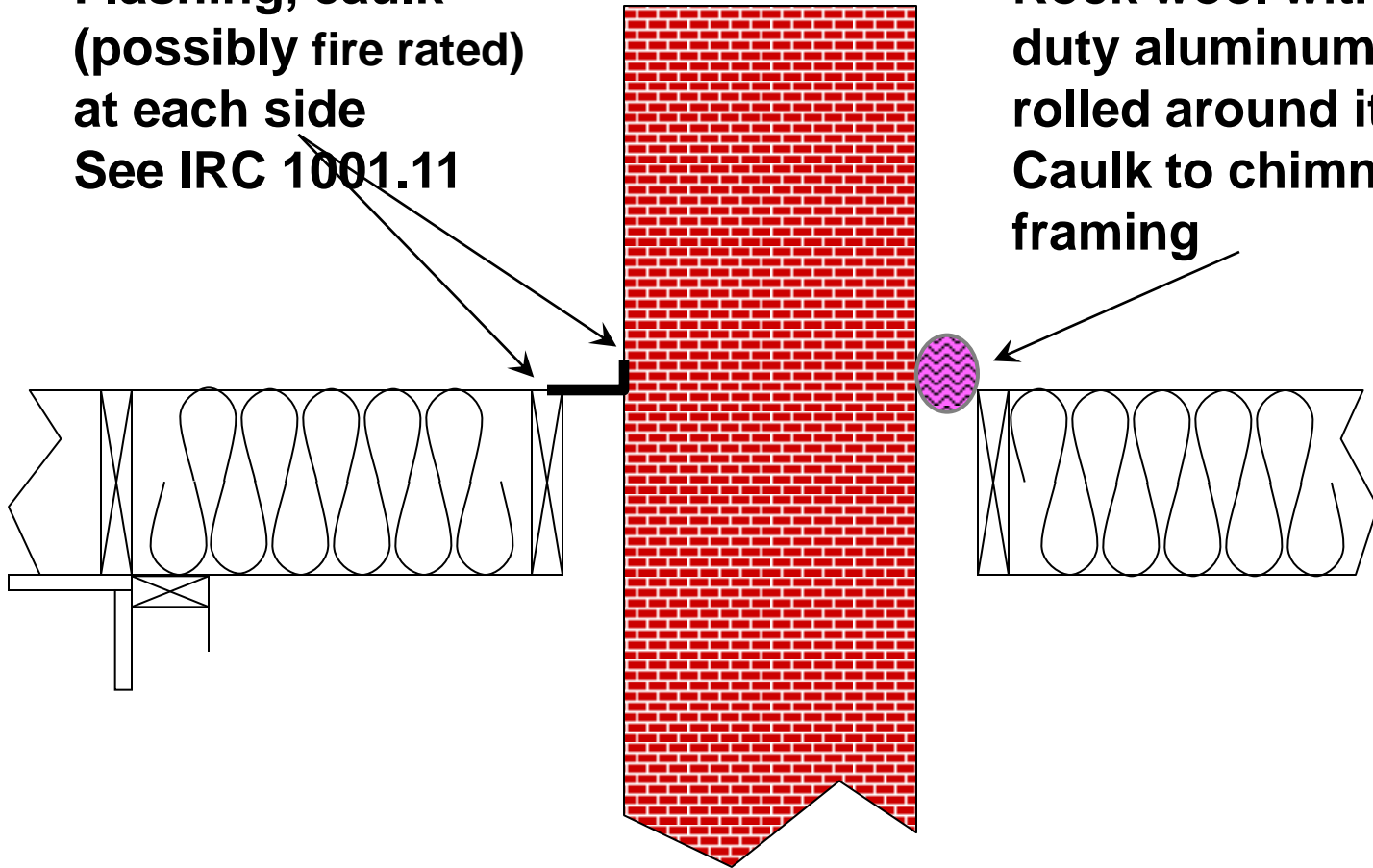


Chimney Chases



Chimney Chase Air Sealing

**Flashing, caulk
(possibly fire rated)
at each side
See IRC 1001.11**



**Rock wool with heavy
duty aluminum foil
rolled around it --
Caulk to chimney and
framing**

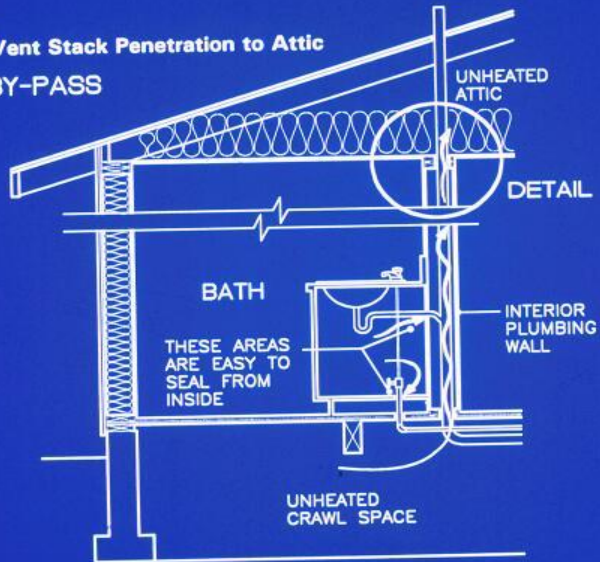
Duct Penetrations...



Plumbing Services...

Figure 5C:
Gasket at Vent Stack Penetration to Attic

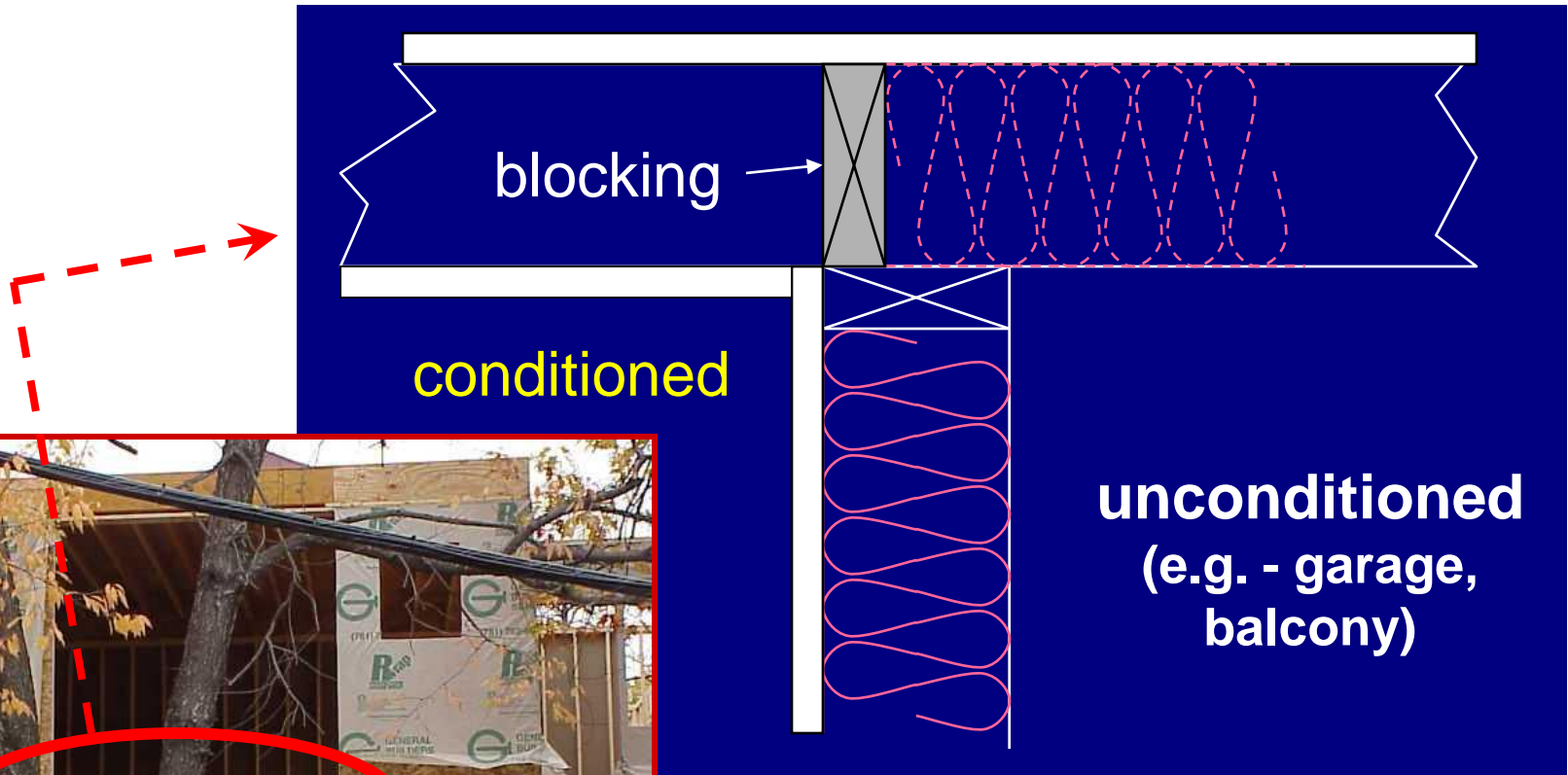
THE BY-PASS



Bathtub Penetrations



Overhang/cantilever Air Sealing



Foundations!



Seal Foundation
Penetrations!

Air Barrier and Insulation Inspection Checklist

TABLE 402.4.2
AIR BARRIER AND INSULATION INSPECTION COMPONENT CRITERIA

COMPONENT	CRITERIA
Air barrier and thermal barrier	Exterior thermal envelope insulation for framed walls is installed in substantial contact and continuous alignment with building envelope air barrier. Breaks or joints in the air barrier are filled or repaired. Air-permeable insulation is not used as a sealing material. Air-permeable insulation is inside of an air barrier.
Ceiling/attic	Air barrier in any dropped ceiling/soffit is substantially aligned with insulation and any gaps are sealed. Attic access (except unvented attic), knee wall door, or drop down stair is sealed.
Walls	Corners and headers are insulated. Junction of foundation and sill plate is sealed.
Windows and doors	Space between window/door jambs and framing is sealed.
Rim joists	Rim joists are insulated and include an air barrier.
Floors (including above-garage and cantilevered floors)	Insulation is installed to maintain permanent contact with underside of subfloor or joists. Air barrier is installed at any exposed edge of insulation.
Crawl space walls	Insulation is permanently attached to walls. Exposed earth in unvented crawl spaces is covered with Class I vapor retarder. Overlapping joints taped.
Shafts, penetrations	Duct shafts, utility penetrations, knee walls and flue shafts opening to exterior or unconditioned space are sealed.
Narrow cavities	Batts in narrow cavities are cut to fit, or narrow cavities are filled by sprayed/blown insulation.
Garage separation	Air sealing is provided between the garage and conditioned spaces.
Recessed lighting	Recessed light fixtures are air tight, IC rated, and sealed to drywall. Exception—fixtures in conditioned space.
Plumbing and wiring	Insulation is placed between outside and pipes. Batt insulation is cut to fit around wiring and plumbing, or sprayed/blown insulation extends behind piping and wiring.
Shower/tub on exterior wall	Showers and tubs on exterior walls have insulation and an air barrier separating them from the exterior wall.
Electrical/phone box on exterior walls	Air barrier extends behind boxes or air sealed-type boxes are installed.
Common wall	Air barrier is installed in common wall between dwelling units.
HVAC register boots	HVAC register boots that penetrate building envelope are sealed to subfloor or drywall.
Fireplace	Fireplace walls include an air barrier.

New
Code
Requirement

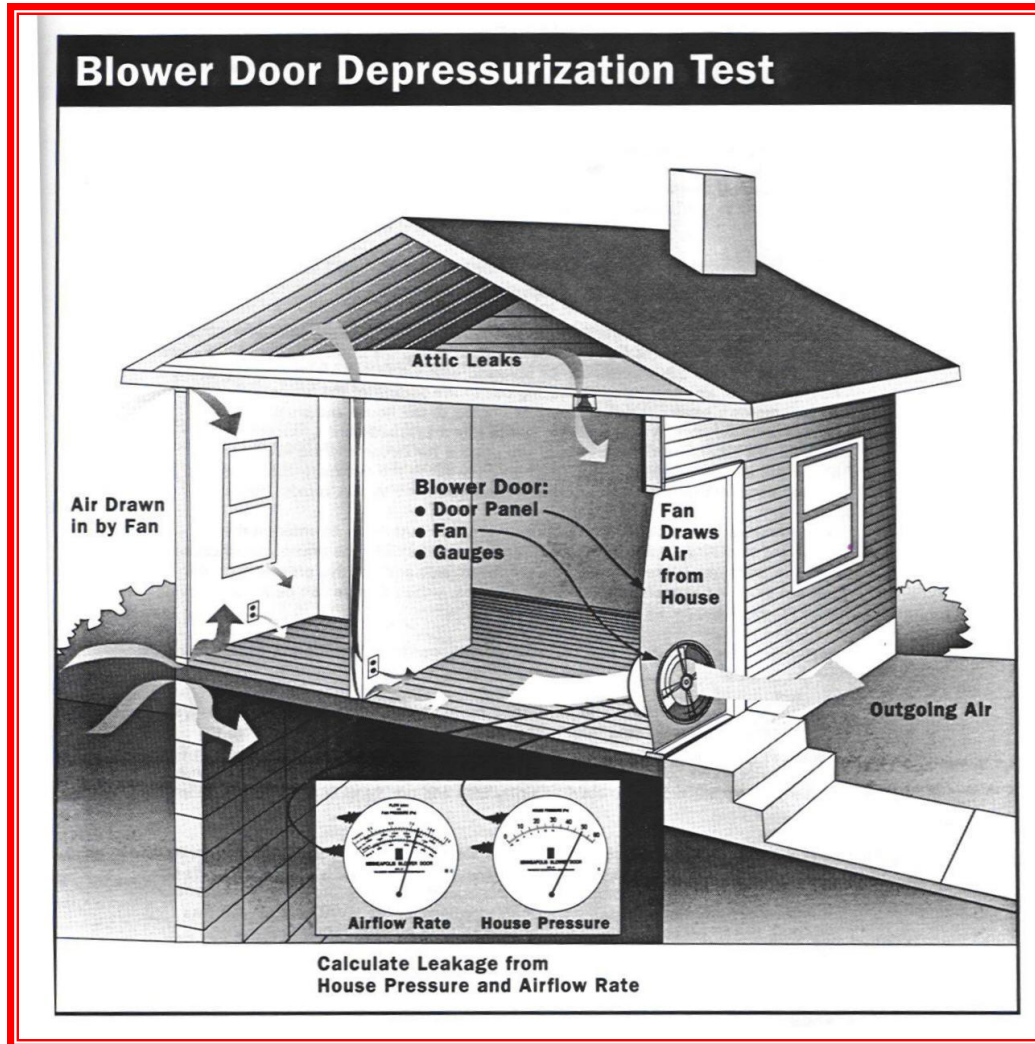
OR...A Blower Door Test



**New
Code
Requirement**

- ✓ Blower Door Test
Depressurizes the House to Measure the Over-all Air Leakage Rate
- ✓ When tested, the tightness must be at or below 7 Air Changes per Hour at a 50 Pa pressure difference
- ✓ Air Leakage can account for a major amount of home heat loss, and lead to other performance problems
- ✓ Formula:
$$ACH_{50} = CFM_{50} * 60 / \text{Volume}$$

Air Infiltration



We have learned much over the years from the “Blower Door Test”

Air Leakage Can Be More Than a Third of the Total Heat Loss in a Conventionally Built Home

An Important ENERGY STAR® label Homes Requirement is an Air Tightness Test or Blower Door Test

Any Evidence of Air Infiltration?



Any Evidence of Air Infiltration?



Fireplaces

- New wood-burning fireplaces shall have gasketed doors and outdoor combustion air.



New
Code
Requirement

Recessed Lighting Fixtures

- **Type IC rated, *and labeled* with no penetrations** between the inside of the recessed fixture and ceiling cavity (sealed and caulked)
- **Sealed with a gasket or caulk** between housing and wall or ceiling covering
- Type IC rated, in accordance with **ASTM E 283** to be an **“Air-Tight”** enclosure



Basic Requirements

Vapor Retarder

A vapor barrier or vapor diffusion retarder (VDR) is a material that reduces the rate at which water vapor can move through a material.

VAPOR RETARDER CLASS. A measure of the ability of a material or assembly to limit the amount of moisture that passes through that material or assembly. Vapor retarder class shall be defined using the desiccant method with Procedure A of ASTM E 96 as follows:

Class I: 0.1 perm or less

Class II: $0.1 < \text{perm} \leq 1.0$ perm

Class III: $1.0 < \text{perm} \leq 10$ perm

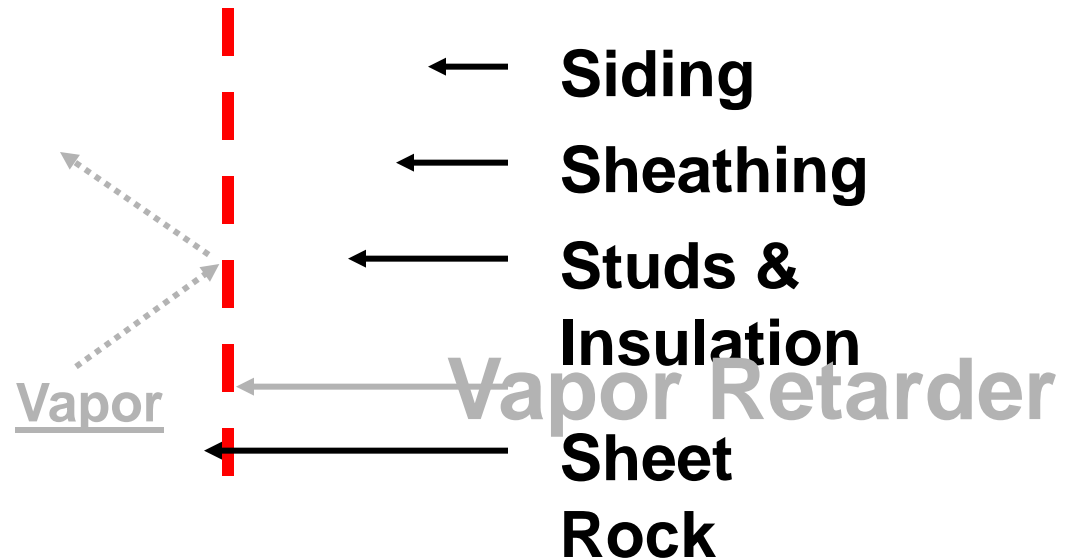


Building Plans

No longer a requirement in the IECC

Vapor Retarders

- No longer a requirement of the IECC – in IRC
- NOT required in Climate Zone 4



*Change
In Code
Requirement*

Zone 1-4 Exempt
Zones 5-8 Have exceptions
(see IRC Chapter 6,
IBC Chapter 14)

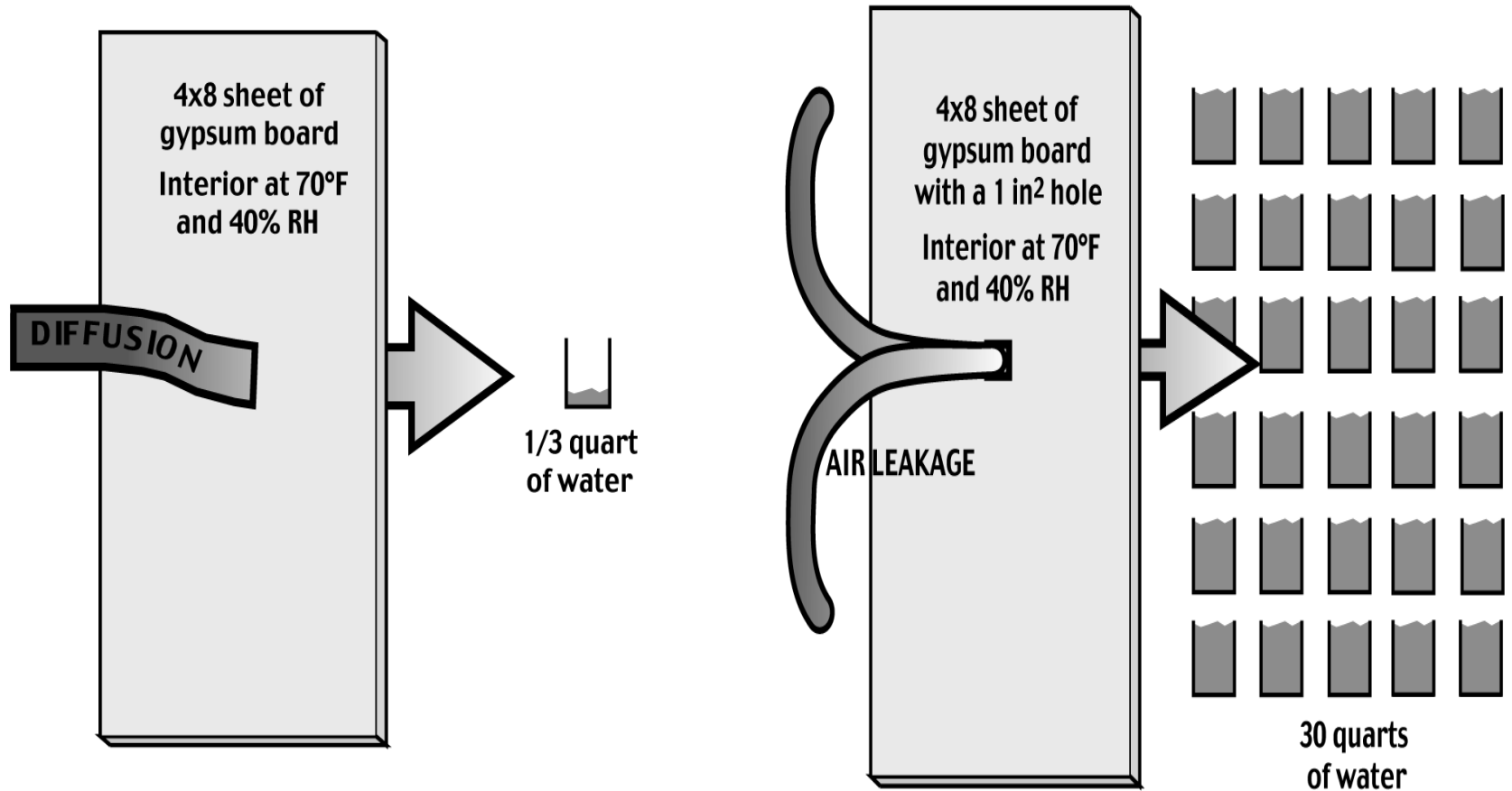
Vapor Retarders

One Example:
Poly Vapor Retarder
(probably a bad idea in
any climate)

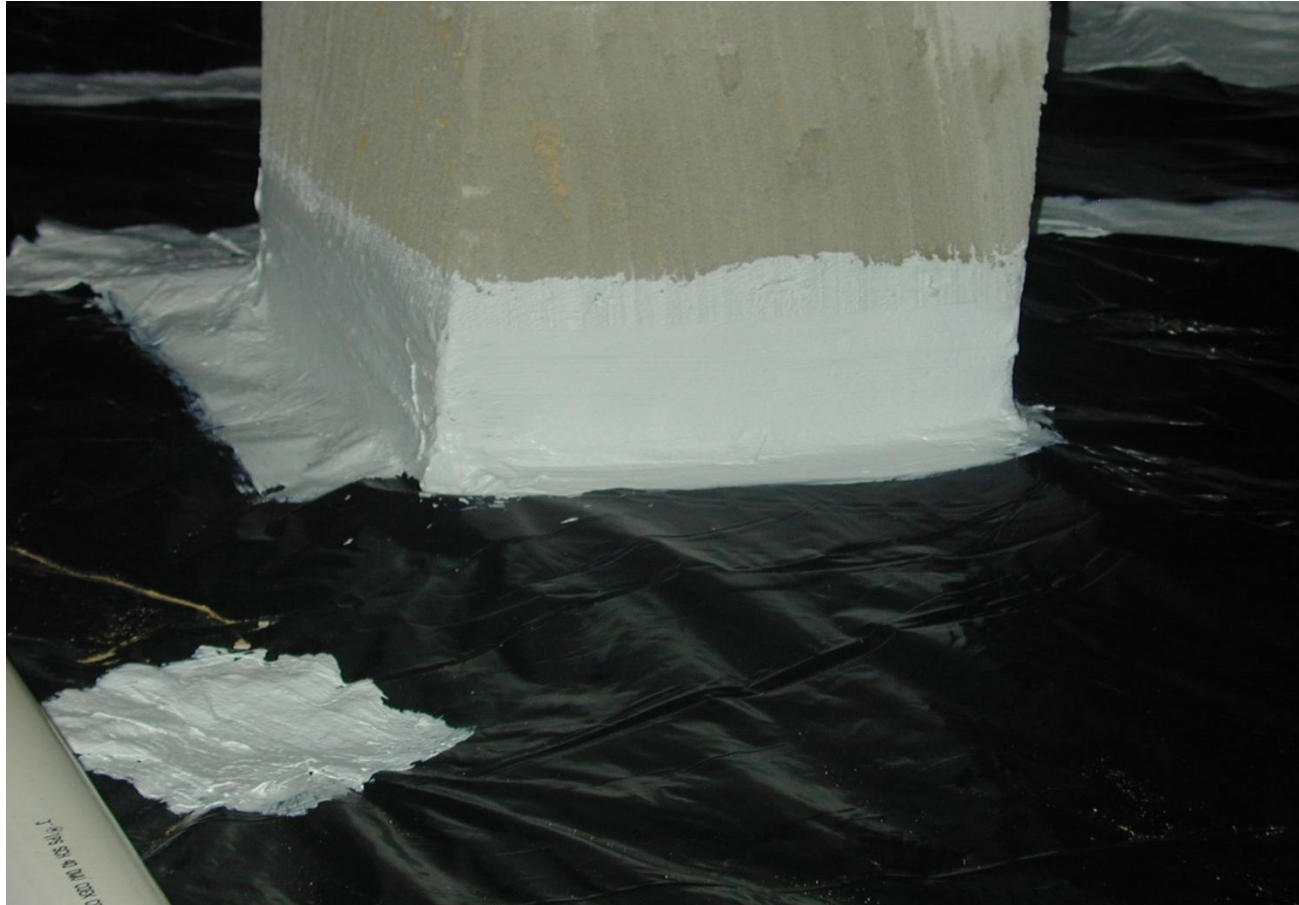


Another Example:
Kraft-Faced Insulation

Why – Diffusion vs. Air Movement



Crawl Floor Vapor Barrier



Class I Vapor retarder – 0.1 Perm or less

Vapor Diffusion

Exterior Conditions

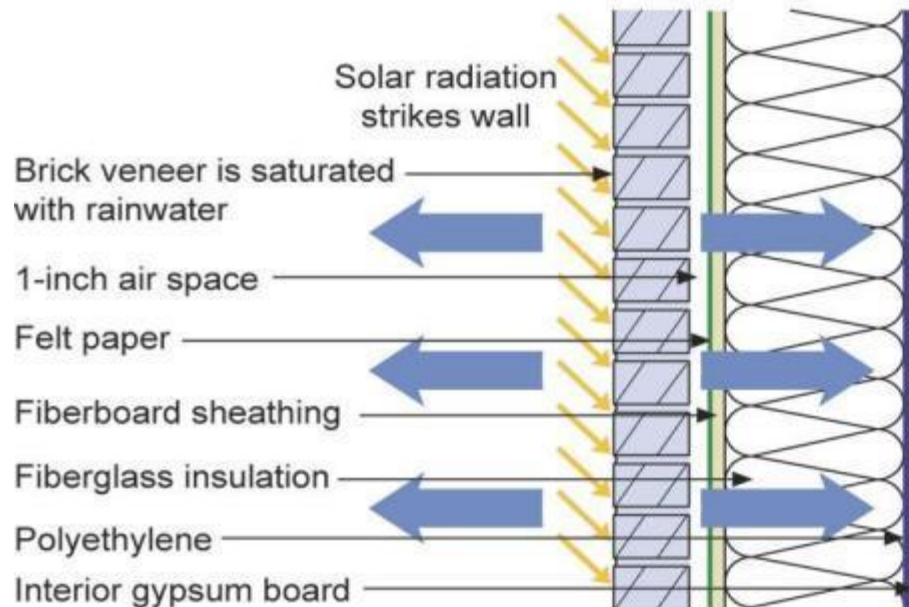
Temperature: 80°F
Relative humidity: 75%
Vapor pressure: 2.49 kPa

Conditions within Cavity:

Temperature: 120°F
Relative humidity: 100%
Vapor pressure: 11.74 kPa

Interior Conditions

Temperature: 75°F
Relative humidity: 60%
Vapor pressure: 1.82 kPa



Vapor is driven both inward and outward by a high vapor pressure differential between the brick and the interior and the brick and the exterior.

Basic Requirements

Ducts

In new home construction or in retrofits, proper duct system design is critical. In recent years, energy-saving designs have sought to include ducts and heating systems in the conditioned space



Building Plans

HVAC Duct Insulation



Ducts

Changed
Code
Requirement

- Insulation
 - Supply and Return Ducts outside the building envelope shall be insulated to R-8 in attics – everywhere else R-6
- Building framing cavities shall not be used as supply ducts
(return ducts still OK- not recommended)



Duct Sealing

- Seal all ducts, air handlers, filter boxes, and building cavities used as ducts.
- Seal and securely fasten all joints, transverse seams and connections with:
 - welds
 - gaskets
 - mastics
 - mastic-plus-embedded fabric systems
 - tapes
- **Unlisted duct tape is not permitted as a sealant on any metal ducts – must be UL-181 A/B listed –per IRC**

Duct Requirements – 2009 IECC

- Locate All Ductwork in Conditioned Space,

OR...

New
Code
Requirement

- *duct tightness test must be performed on the system:*



or



Duct Testing

Heating and cooling systems not 100% in conditioned space must be tested at 0.1" w.c. (25 Pa) and pass either

1. Post-construction test:

Max leakage to outside of 8 cfm/100 ft² of CFA or,
Max total leakage less than or equal to 12 cfm/100 ft² CFA

2. Rough-in test:

Max total leakage of 6 cfm per 100 ft² CFA or,
Max total leakage w/o air handler 4 cfm per 100 ft² CFA

e.g. 2,000 square foot finished house

Max leakage to outside= 160 cfm

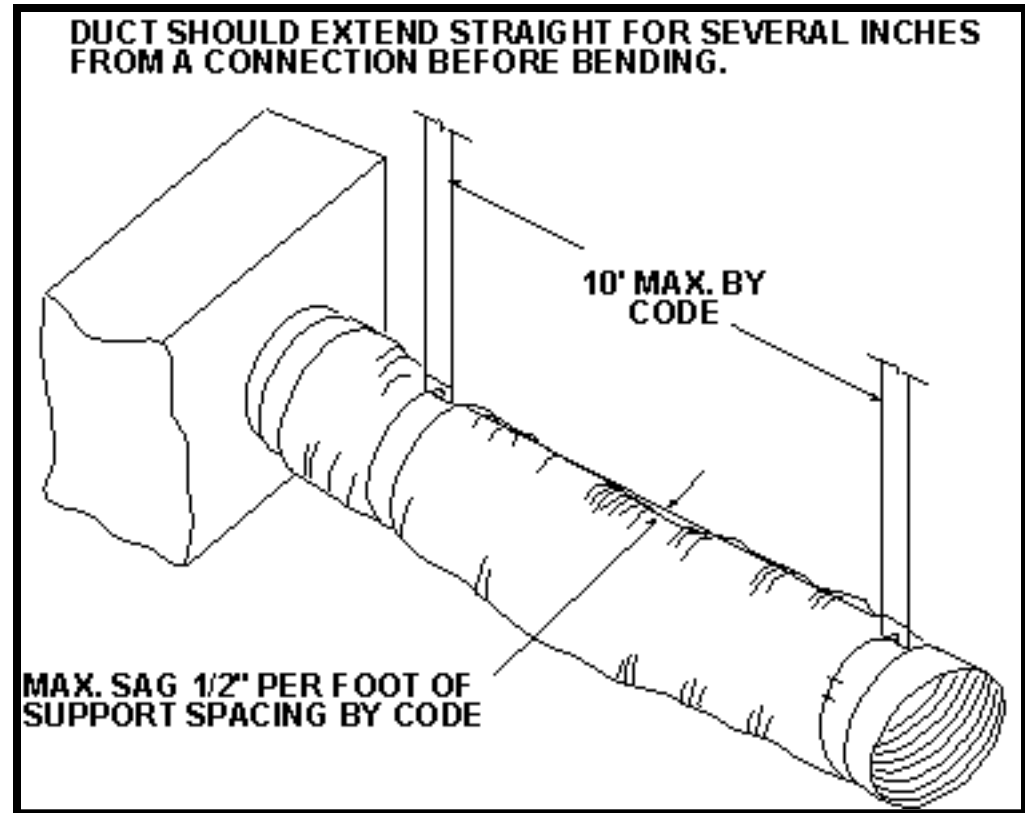
Max total leakage= 240 cfm

Duct Systems Air Sealing



Duct Installation

- Avoid Tight Bends
- Minimize Sagging
- Size Properly
- Place Inside the Envelope (good practice)



So, what's the Big Deal about Ducts?

Well, it depends...

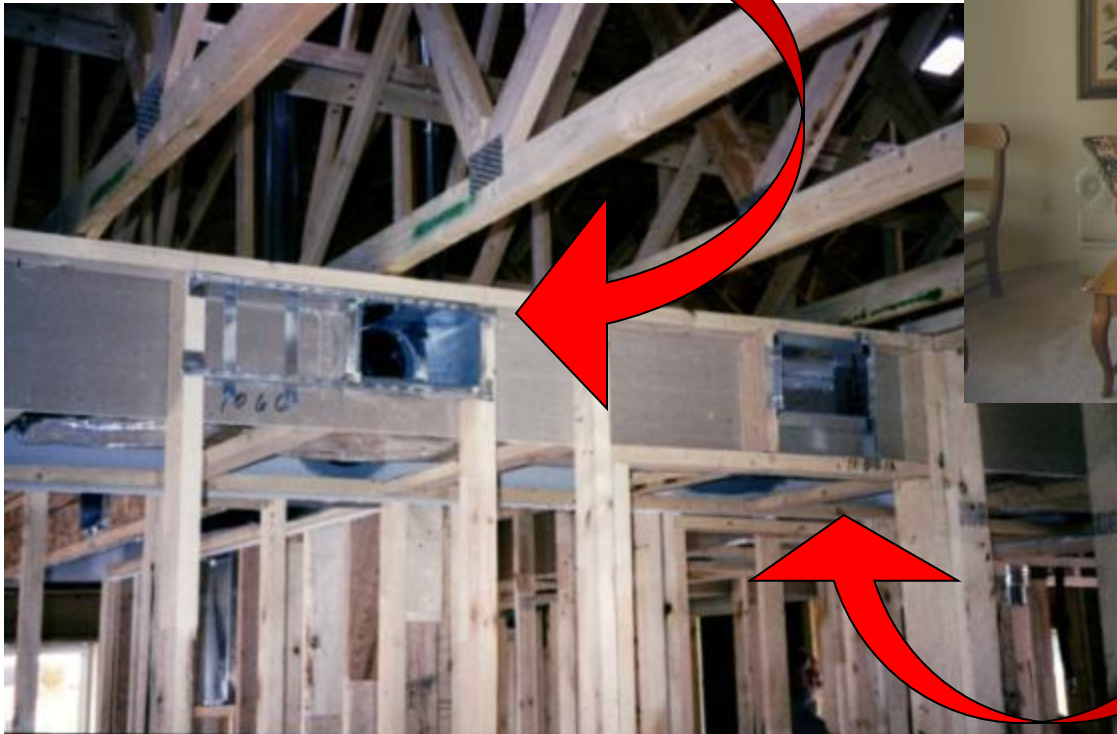


Ducts Inside Conditioned Space

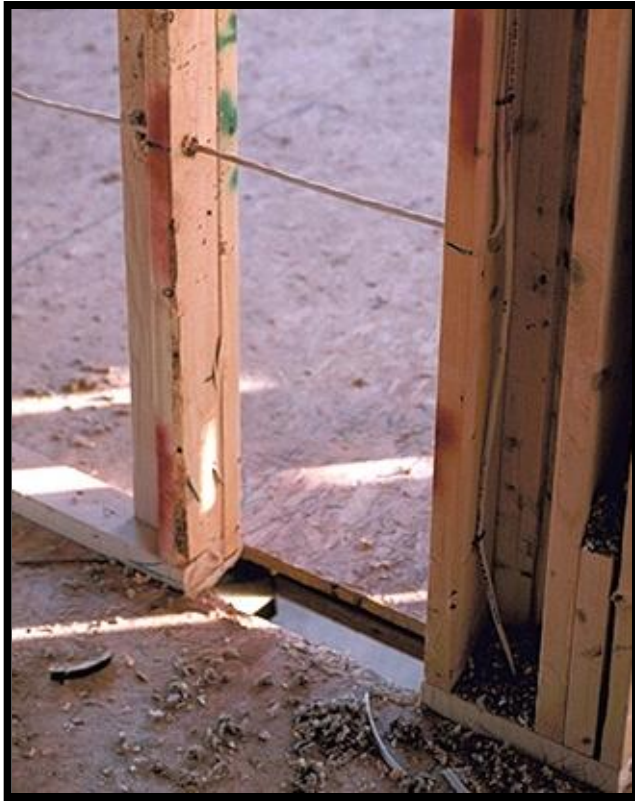
Supply in dropped
soffit



Transfer grille

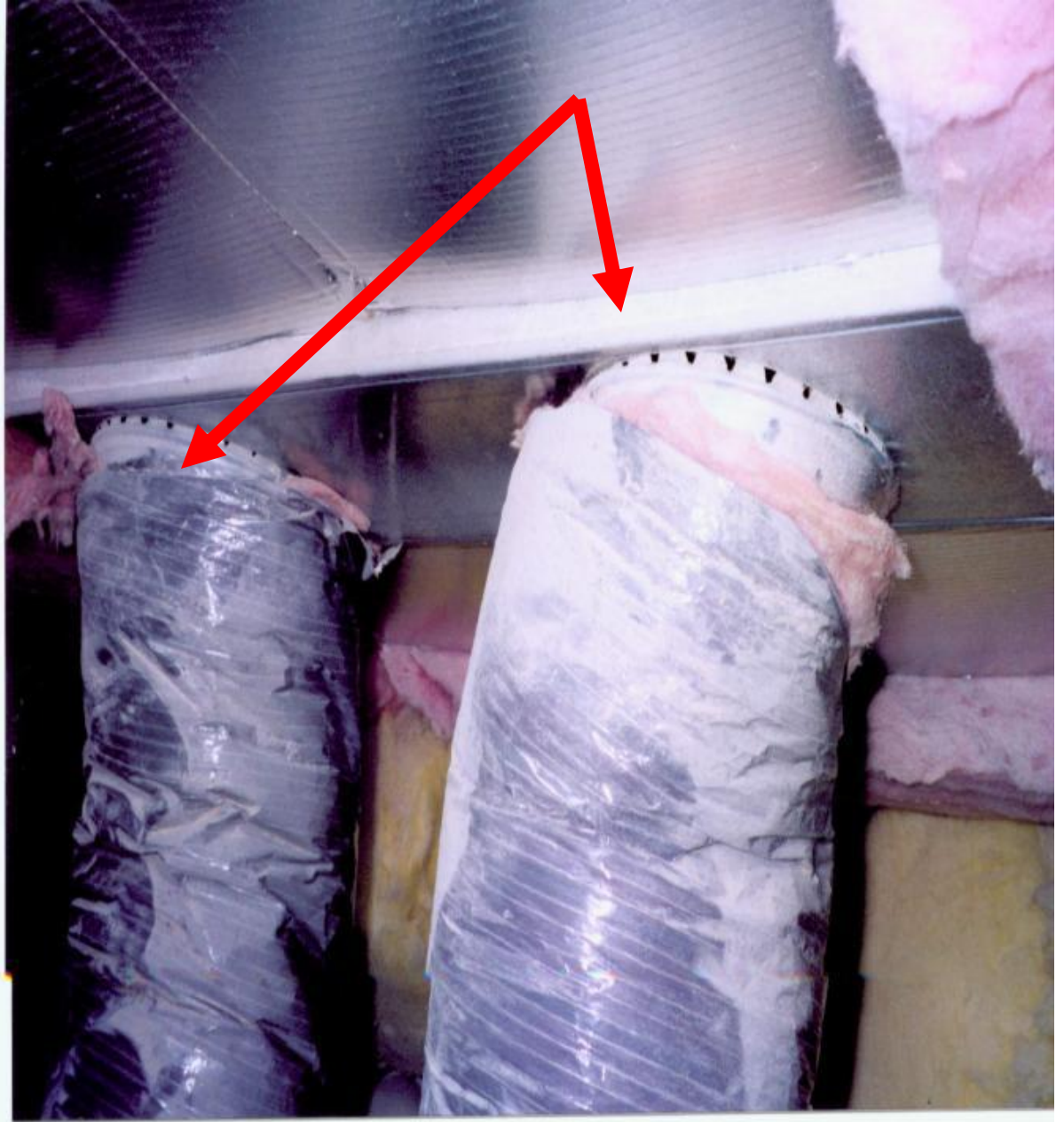


Big Duct Holes and the Code



Leaky Supply
Ducts and Panned
Stud Bays/Floor
Joists.

Don't worry, this
is only a \$2
Million dollar
home!

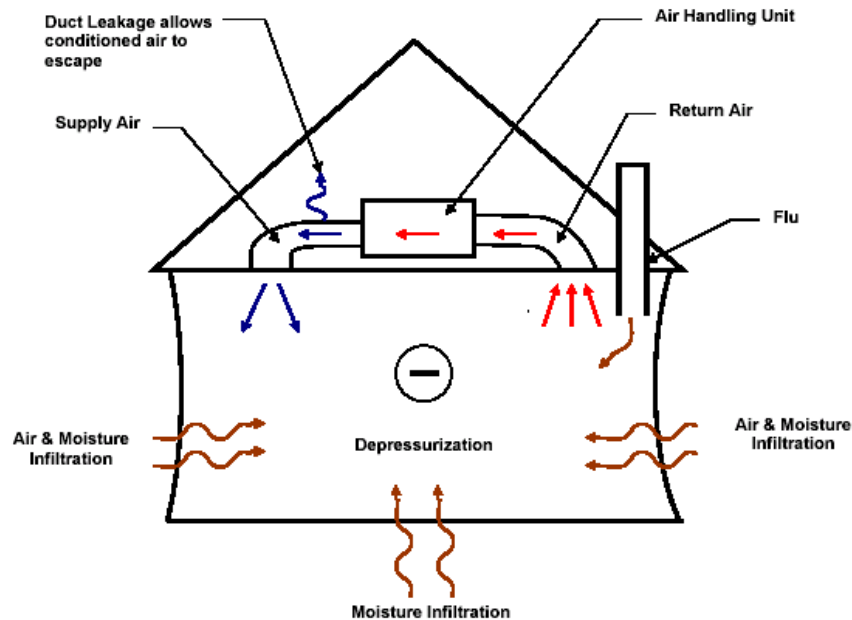


Deal with Pressure Imbalances!!



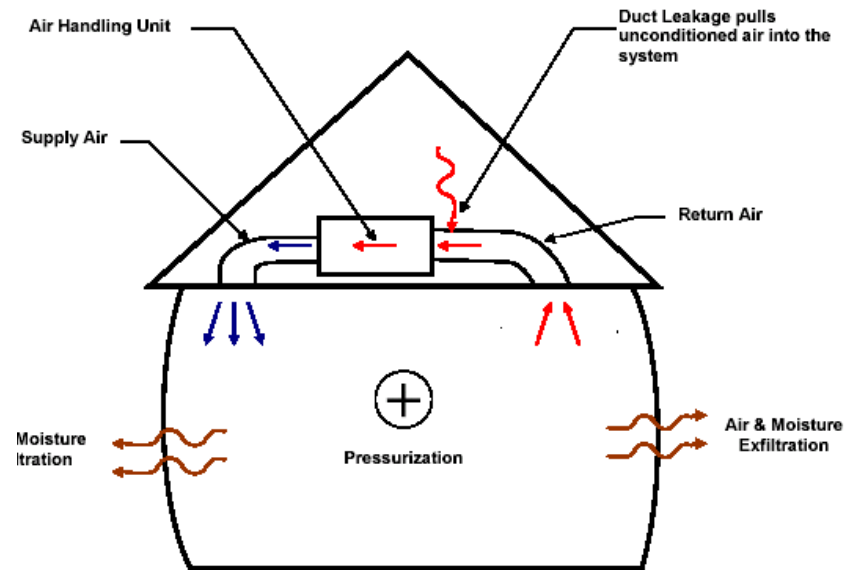
Deal with Pressure Imbalances!!

Supply Side Leakage



More return air than supply air

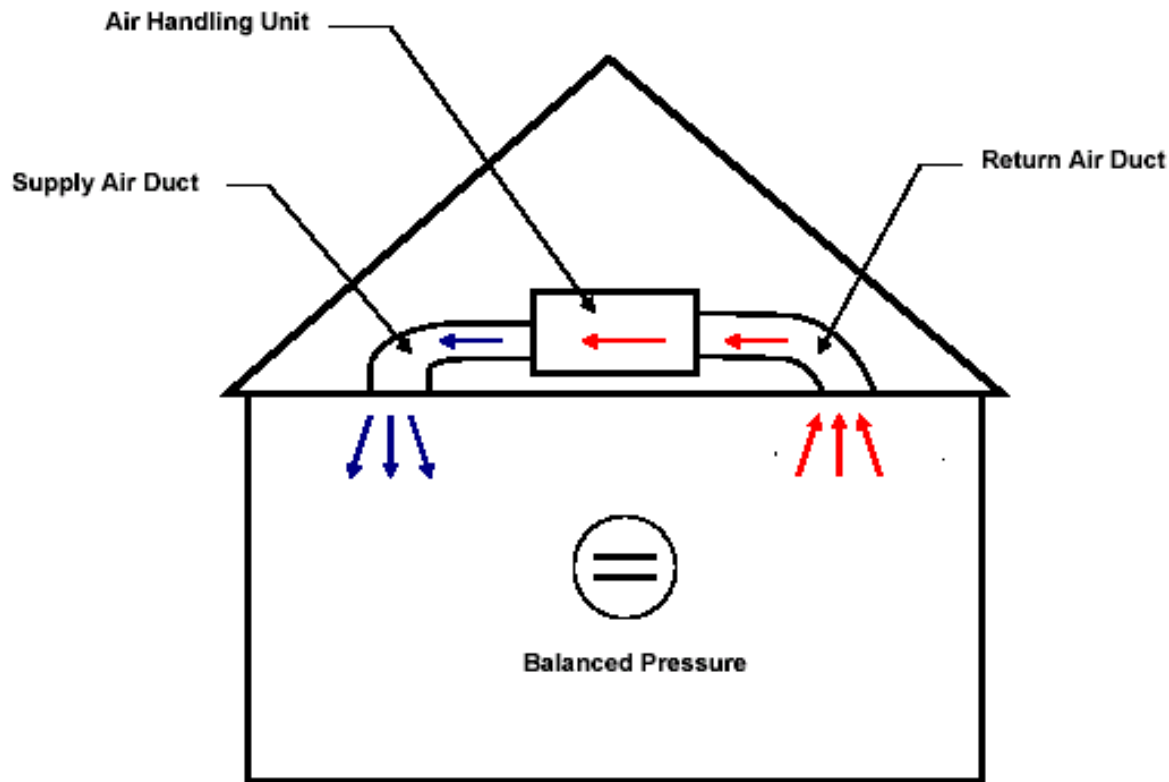
Return Side Leakage



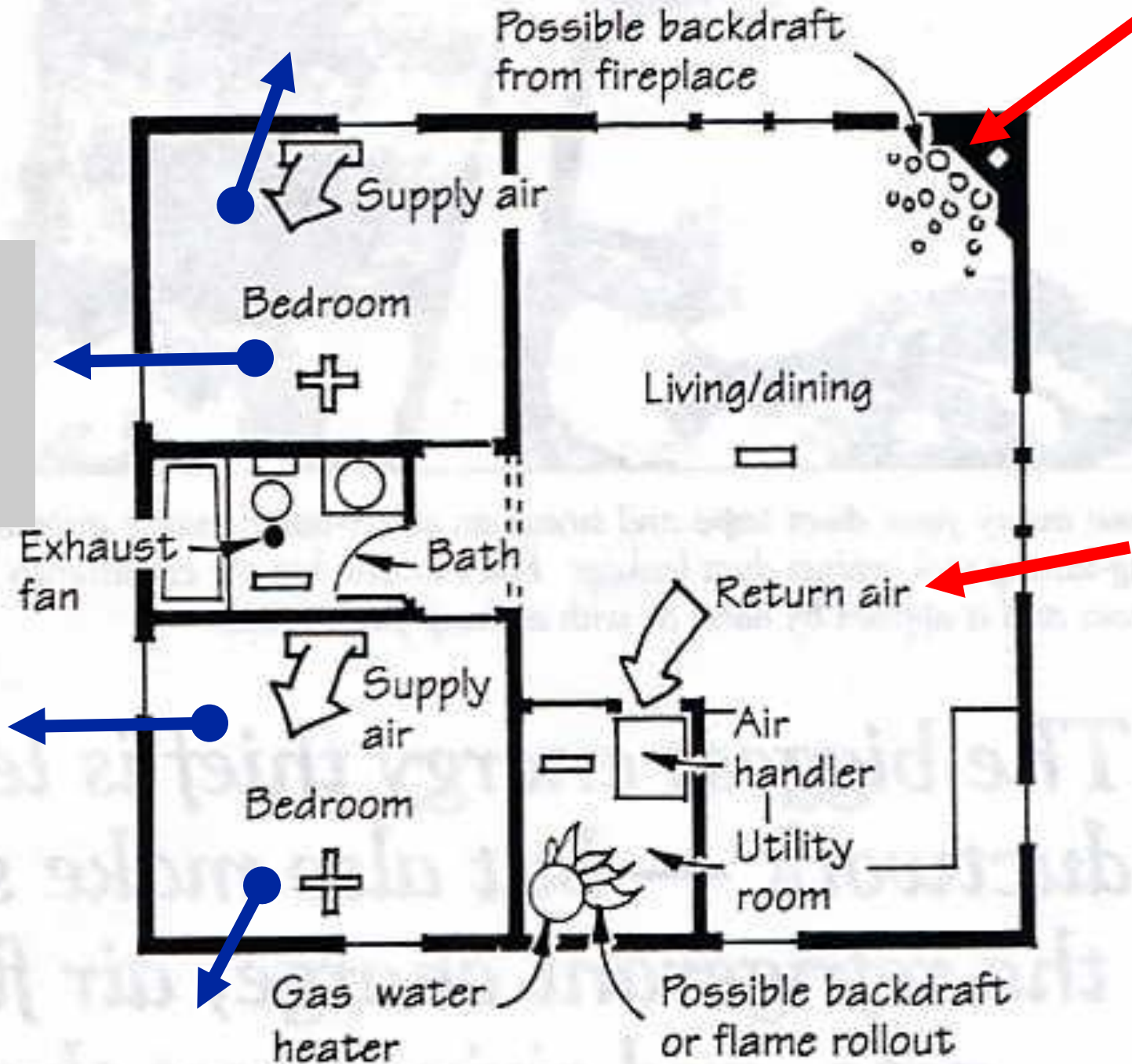
More supply air than return air

Deal with Pressure Imbalances!!

Balanced System



Door Closure Effect



Transfer Grille for Pressure Relief and Return Air Flow

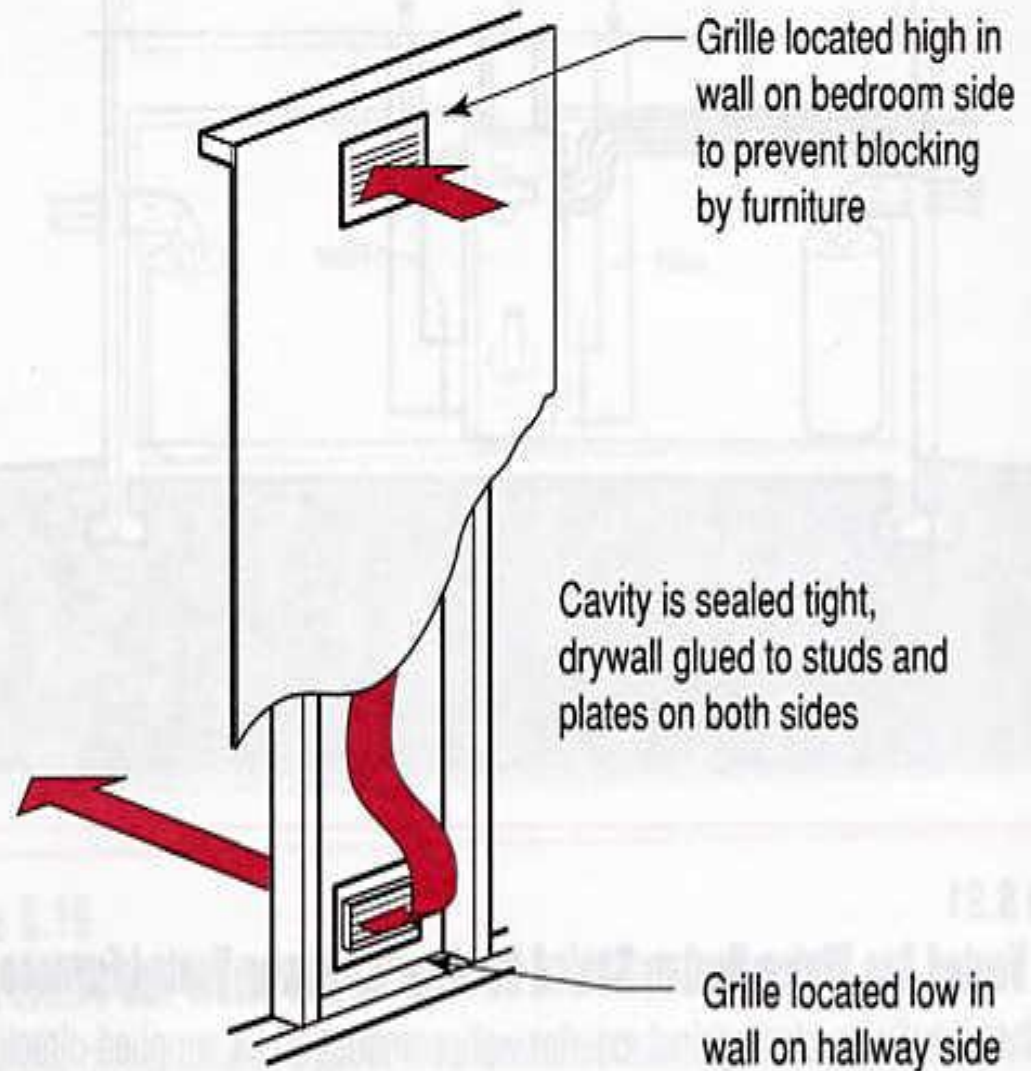
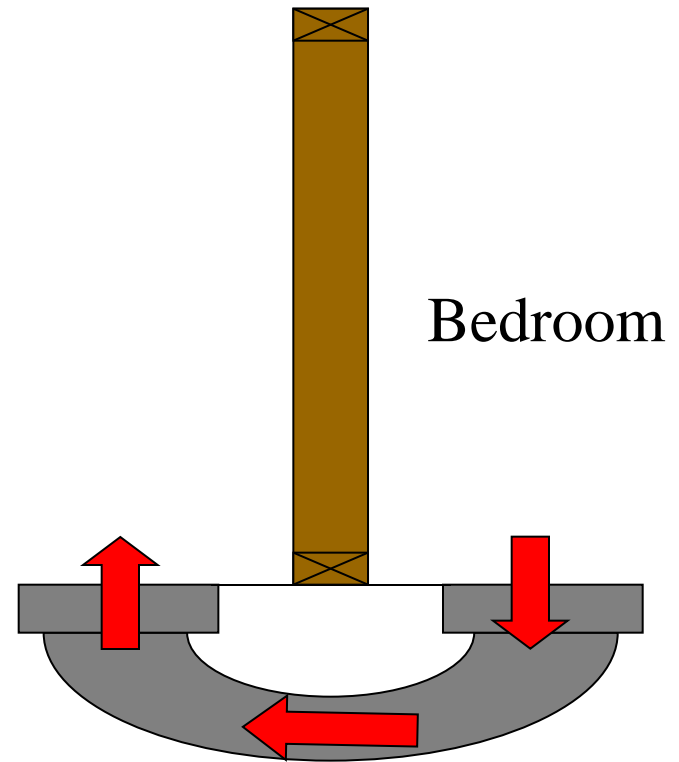
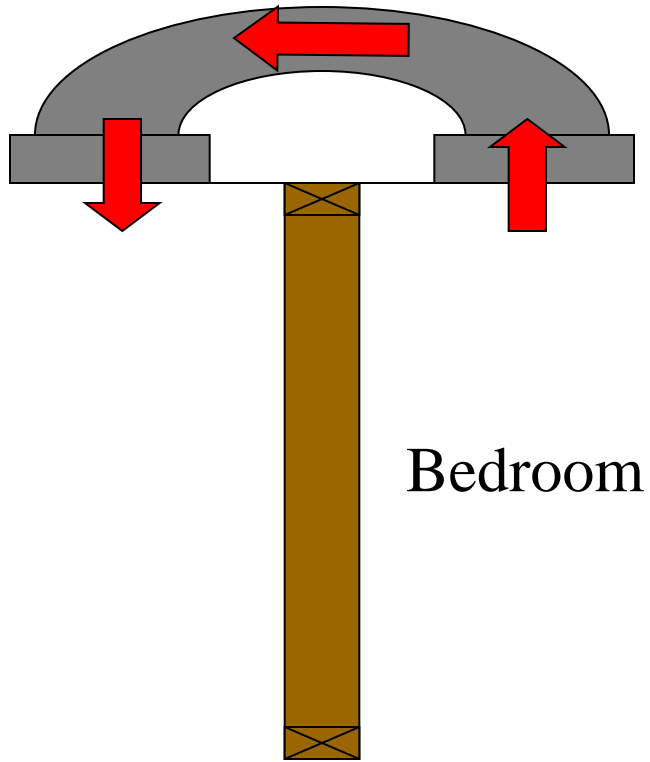
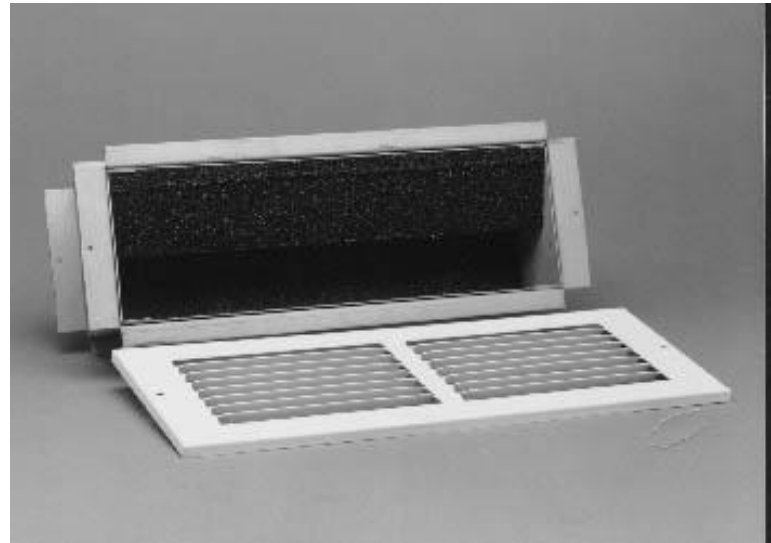
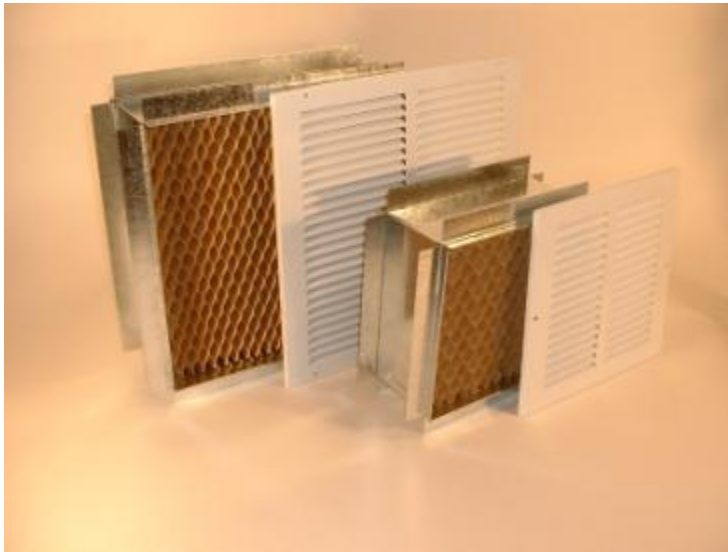


Figure 8.23
Transfer Grille

The “Jump Duct” Option



...Or simple, inexpensive
straight-thru transfer grilles like R.A.P. or Xenon !!



Basic Requirements

Mechanical/Electrical Equipment

- Temperature Controls
- HVAC
- Piping Insulation
- Service Hot Water Systems
- Swimming Pools
- Lighting
- Snow Melt Controls



Mandatory Requirements Systems

- Controls – 1 T-stat for each separated heating and cooling system.
- Heat pump supplementary heat
- HVAC piping insulation R-3 (>105 or <55 degrees)
- Circulating hot water systems: R-2
 - Circ. Pump on/off switch
readily accessible

New
Code
Requirement



Ventilation and Equipment Sizing

- Ventilation

- Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating

- Equipment Sizing

- **IECC references Section M1401.3 of the IRC**
- Load calculations determine the proper capacity (size) of equipment
 - Goal is big enough to ensure comfort but no bigger
- **Calculations shall be performed in accordance with ACCA Manual S and Loads from ACCA Manual J or other approved methods (Long-Hand ASHRAE Handbook of Fundamentals)**

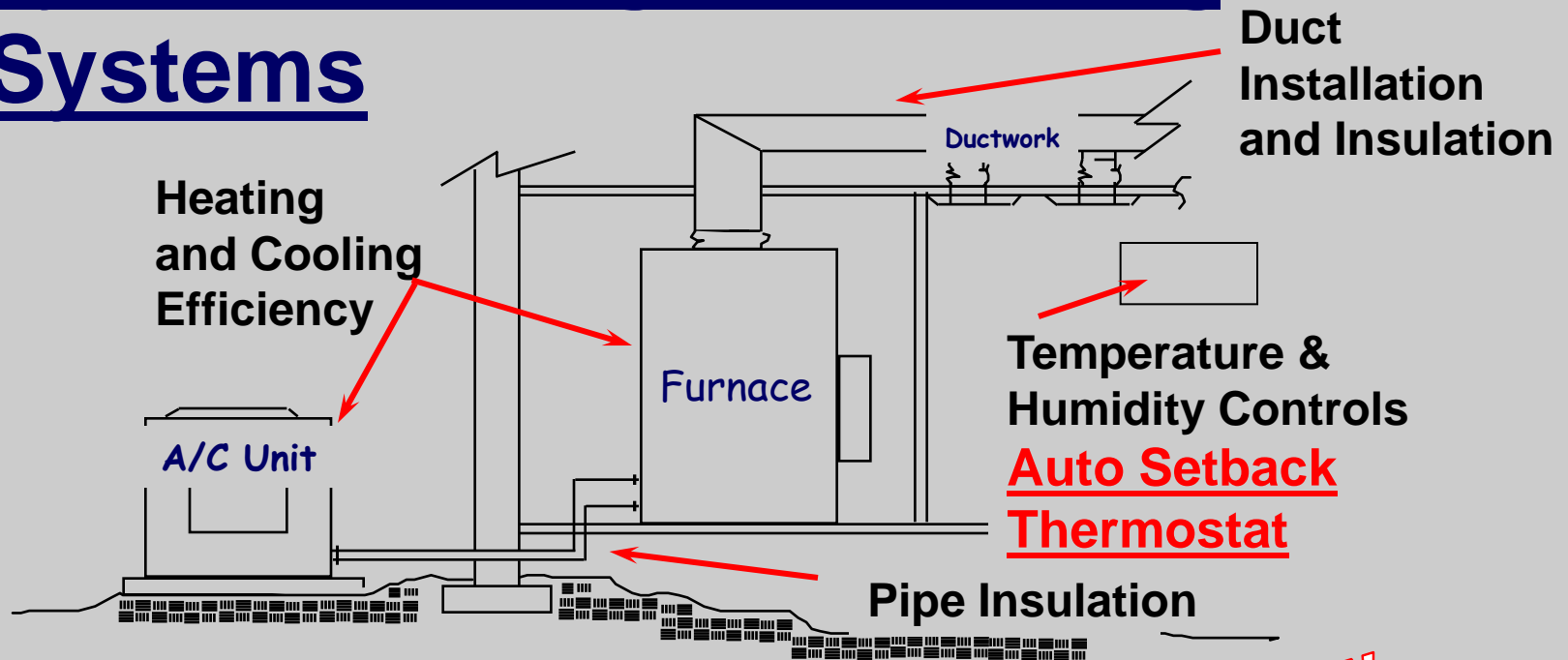
*New
Emphasis
In Code*



PROPER SIZING OF A/C UNITS AND DUCTS

HVAC Systems

Typical Heating and Cooling Systems



Programmable T-stat for Furnaces

**New
Code
Requirement**

Pool Requirements (403.9)

- Pool heaters (403.9.1)
 - Readily accessible on-off switch
 - Natural gas or LPG fired pool heaters will not have continuously burning pilot lights
- Time switches (403.9.2)
 - Automatic controls required to operate pool heaters and pumps on a preset schedule
 - Exceptions
 - Where public health standards require 24 hour operation
 - Where pumps are required to operate solar and waste heat recovery pool heating systems

Pool Covers (403.9)

- Heated pools required to have a pool cover
 - Pool cover must be vapor retardant
- Pools heated to over 90°F
 - Minimum R-12 insulation
- Exception
 - Pools deriving > 60% energy for heating from site-recovered energy or solar source



New
Code
Requirement

High-Efficiency Lamps Required (404.1)

Prescriptive Path



New
Code
Requirement

- Applies to permanently installed lighting fixtures
- Requires 50% to be
 - ✓ Compact Fluorescent
 - ✓ T-8 Linear Fluorescent
 - ✓ Meet minimum efficacy requirements (see definition)
- Applies to interior and exterior lighting
- Can be met with CFLs
- Lamps **NOT** fixtures

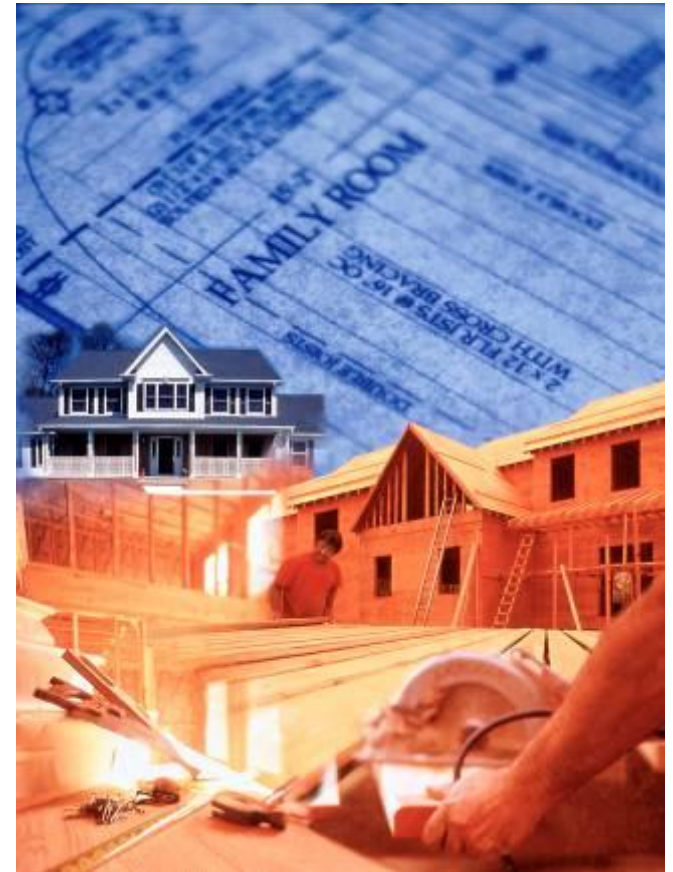
Snow Melt Controls for Residential and Commercial Projects

- Snow detector that will activate the system from the idle mode to the snow melt mode
- Require a slab temperature sensor that turns the system off when the surface temperature is above 50°F
- Temperature control that shuts the system down when the outdoor temperature is above 40°F



Compliance/Documentation/Inspections

- Code Official has final authority
 - Software, worksheets
 - Above Code Programs
- Electronic media can be used
- Construction work for which a permit is required is subject to inspection
- Certificate is required- electric panel



Compliance/Documentation/Inspections

- Code Officials Inspection
 - Successive and final inspections, and re-inspections if necessary
- Code Validity
 - Code deemed to be illegal or void shall not affect the remainder of the code
- Fees
 - Must be paid before permit is issued
 - Required in accordance with schedule



Certificate (401.3)

- Permanently posted on the electrical distribution panel
- Don't cover or obstruct other required labels
- Includes the following:
 - R-values of insulation – building envelope & insulated ducts
 - U-factors for fenestration
 - HVAC efficiencies and types
 - SWH equipment
 - SHGC for fenestration – Not Required in MD
- If a gas-fired unvented room heater, electric furnace, or baseboard electric heater is installed

*New
Code
Requirement*

While We're At It – Water and Moisture Issues

Covered in the IRC, BUT

**An Issue costing the Construction Industry
over \$9B/Year!**

Residential Code Section 703 – Exterior Covering

- 703.1 – Intent to prevent moisture from getting into wall
- 703.2 – Water-resistant sheathing paper or material tested to ASTM D 226 (Housewraps, other building papers or felts)
- Most Stone veneer and stucco applications require 2 layers-R703.6.3
- 703.7.5 and .8 - **Flashing** required, vague around siding other than Stone or Brick
- Required around openings, doors, windows, fairly vague
- Stone veneer and stucco claddings also require a weep screed

Window Leaks



JUMP!!

Where is the water going to go?







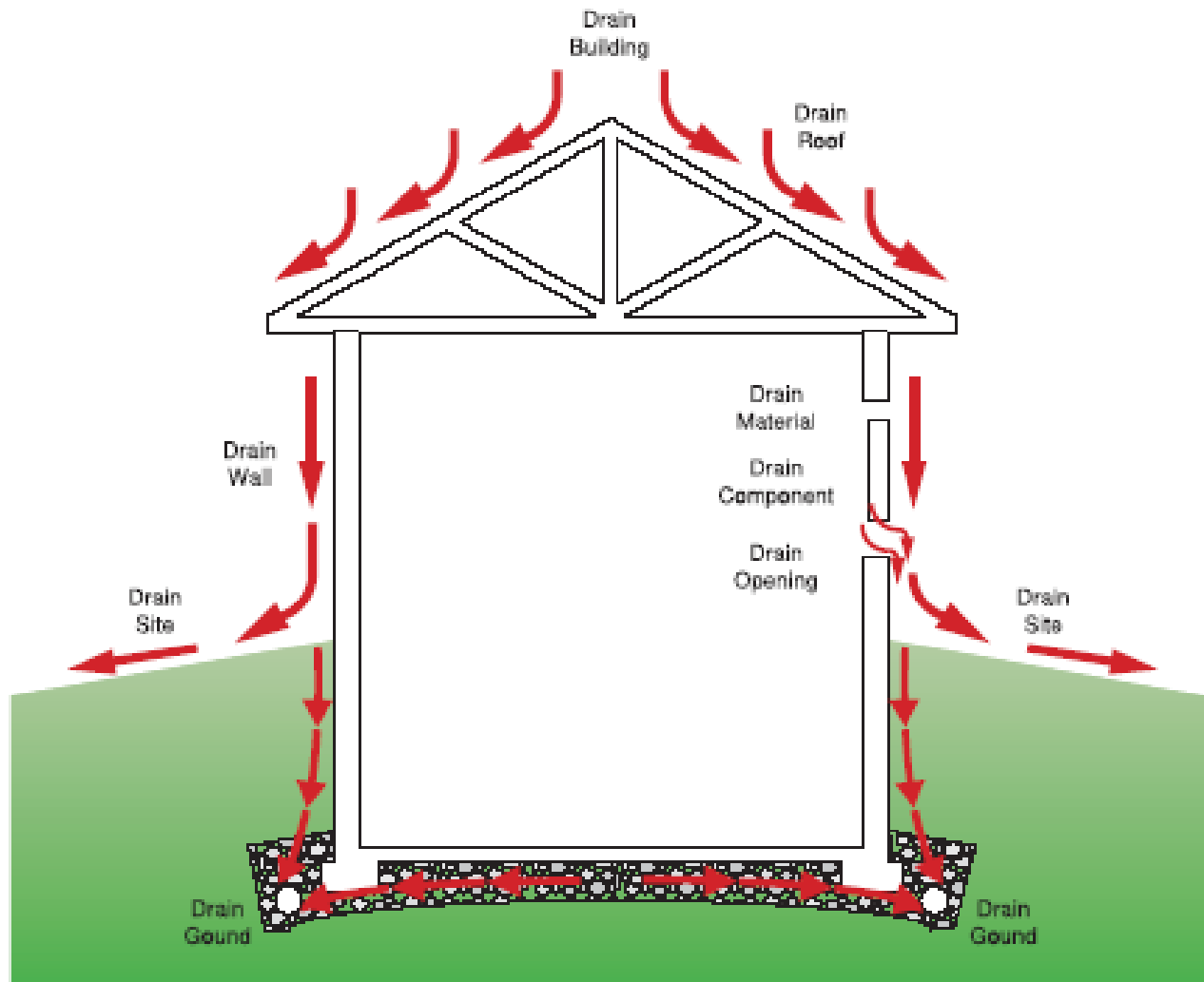
FLASHING AND RUNOFF CONTROLS

And if you don't...





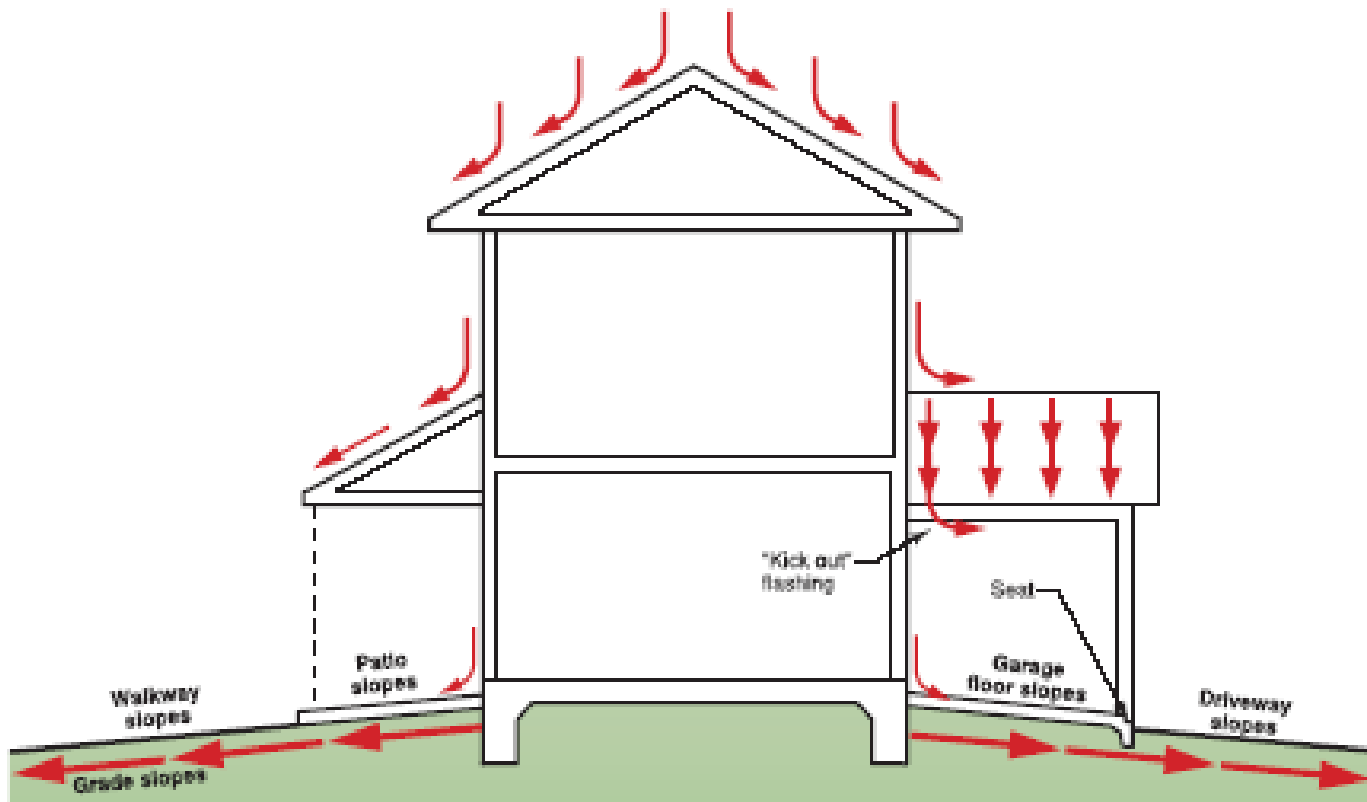
Everything Has to Work



Perhaps Too Drastic

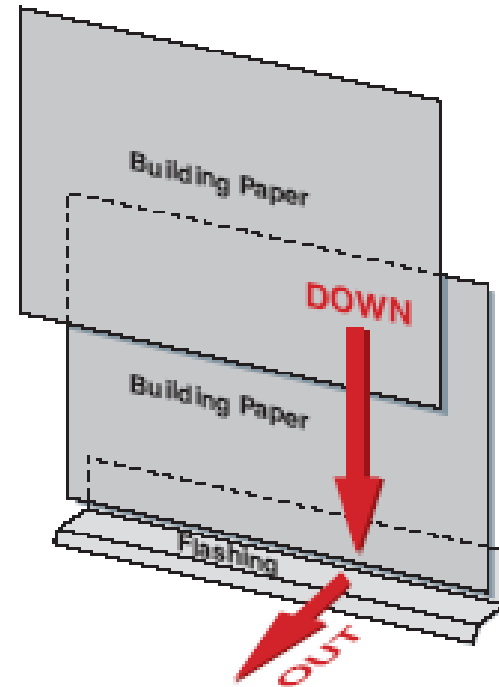


Everything...



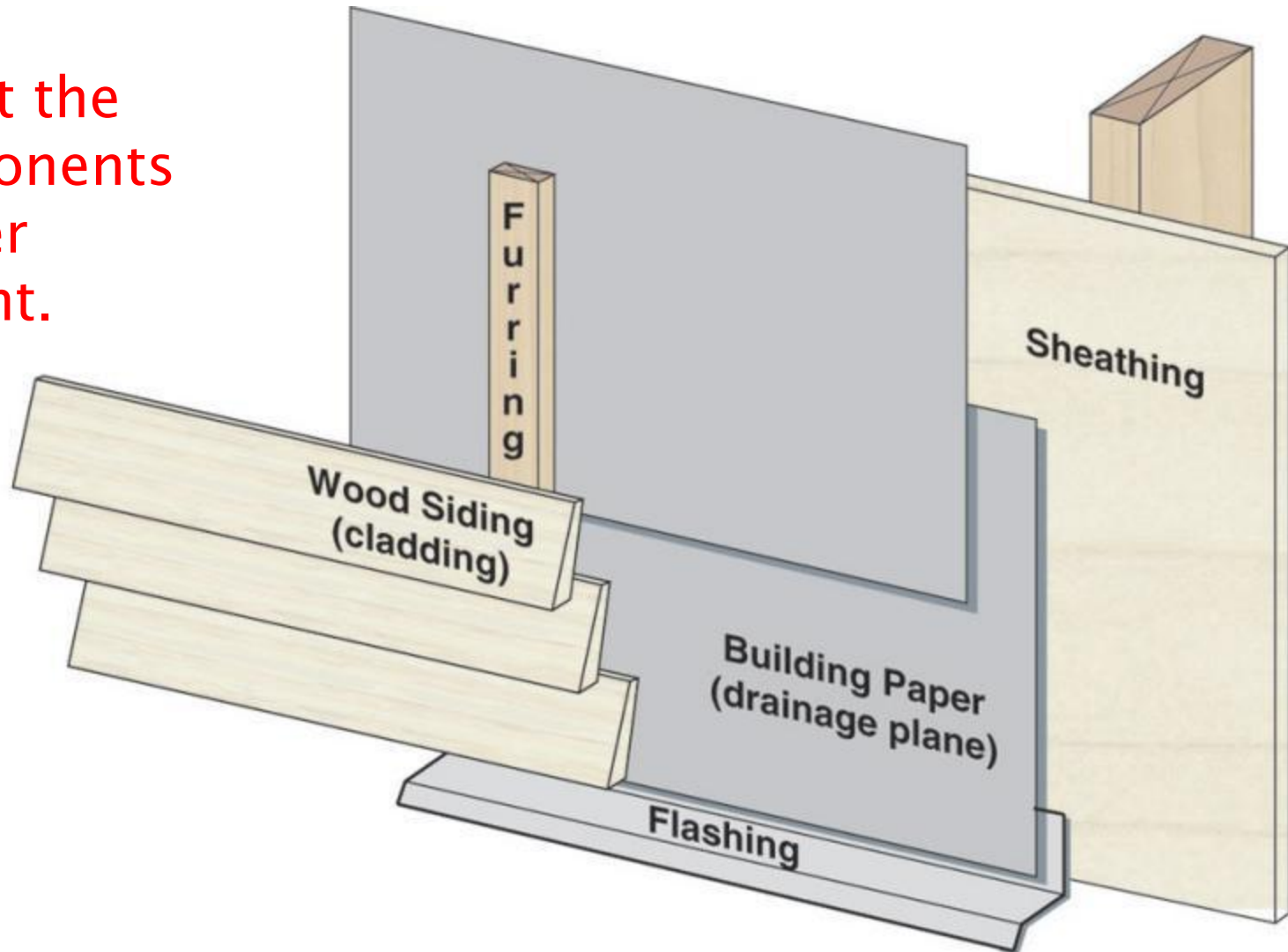
Water Management Fundamentals

- Builders are used to applying basic water management principles daily
 - Shingles
 - Building paper
- Where do we mess up?
 - Almost always at the joints and connections where different things come together



Water Management Simplicity

Let's look at the
basic components
of wall water
management.



One Solution...



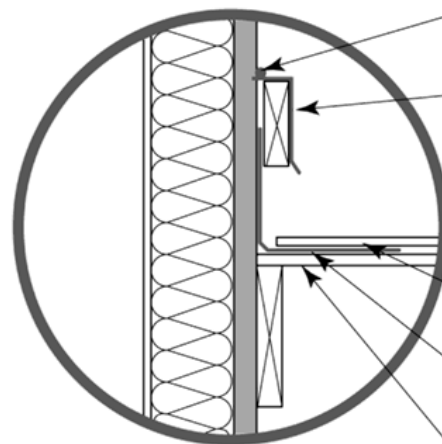
Foil-faced rigid insulation

"Kick-out" end piece

Adhesive membrane strip over step flashing

Step flashing ("baby tins")

Seams and corners taped to provide drainage plane continuity



Sealant

Cap flashing on blocking regletted ("notched") into insulation

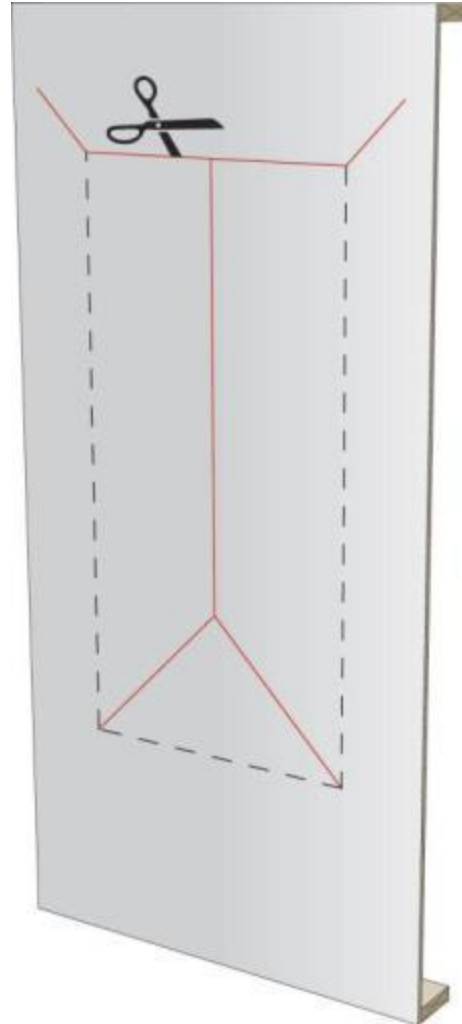
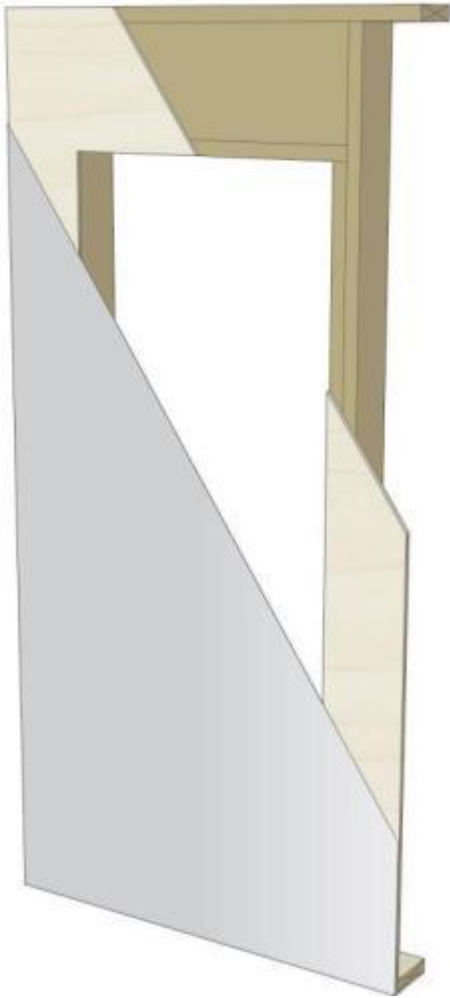
Shingles

Step flashing

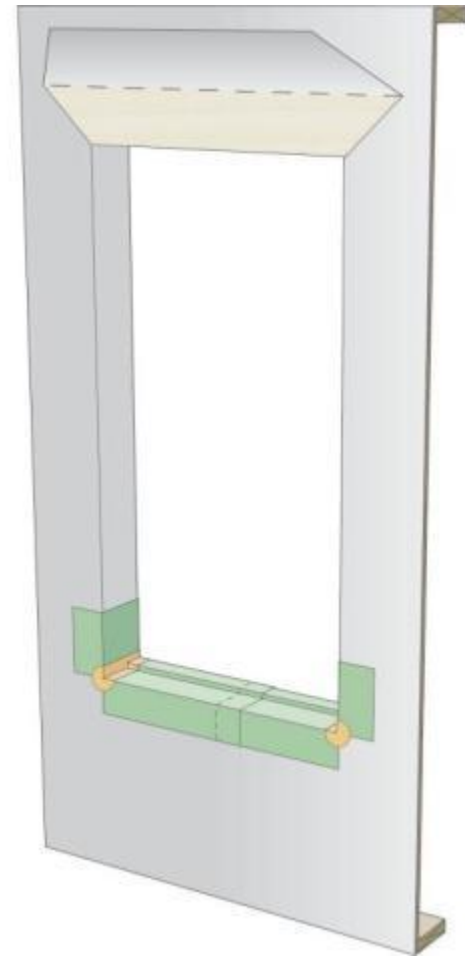
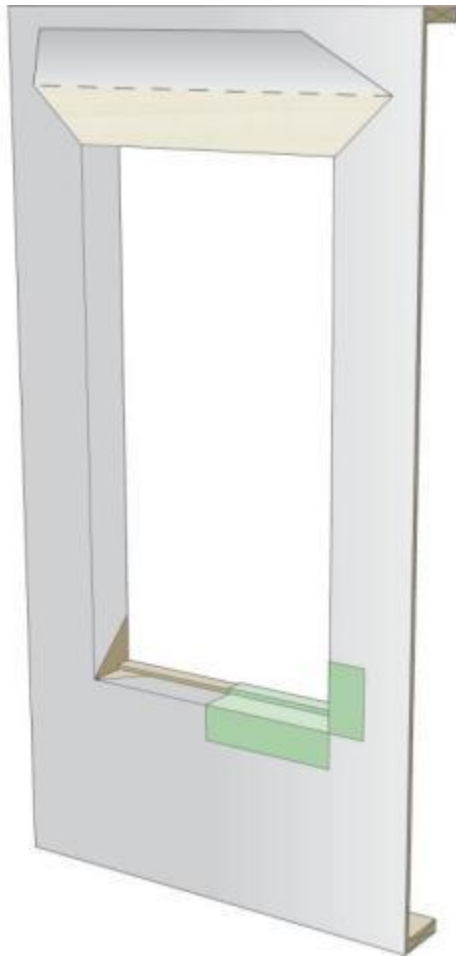
Roof sheathing

Alternate Flashing Detail

Deal With Window and Door Penetrations!

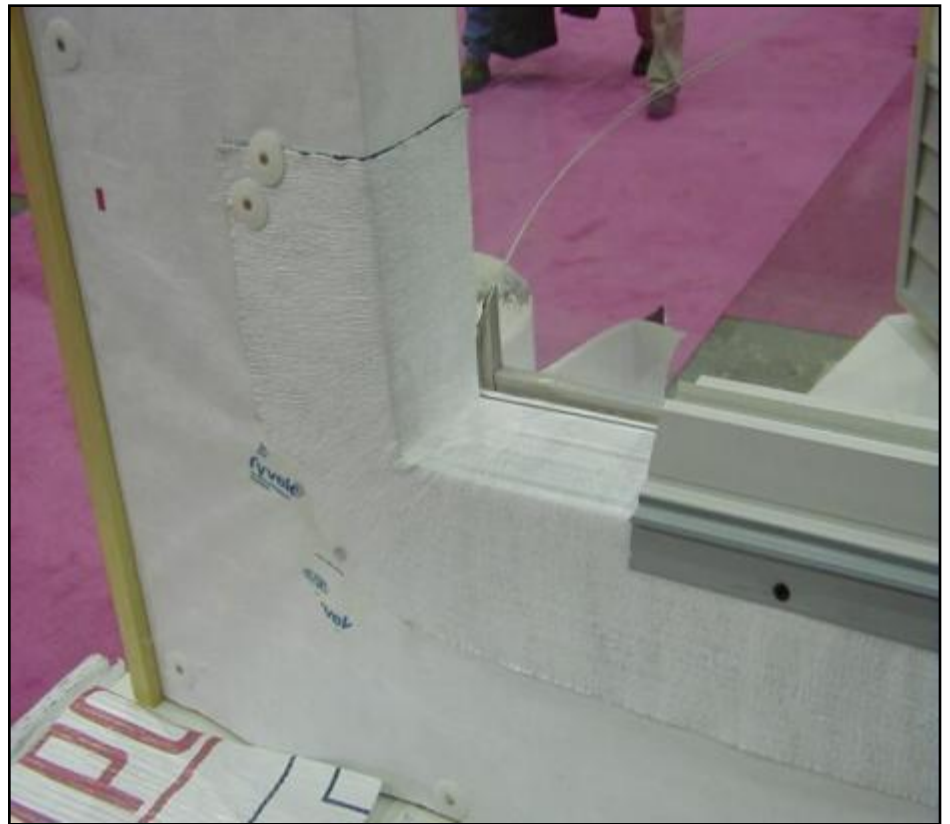


Preparing for the Window...

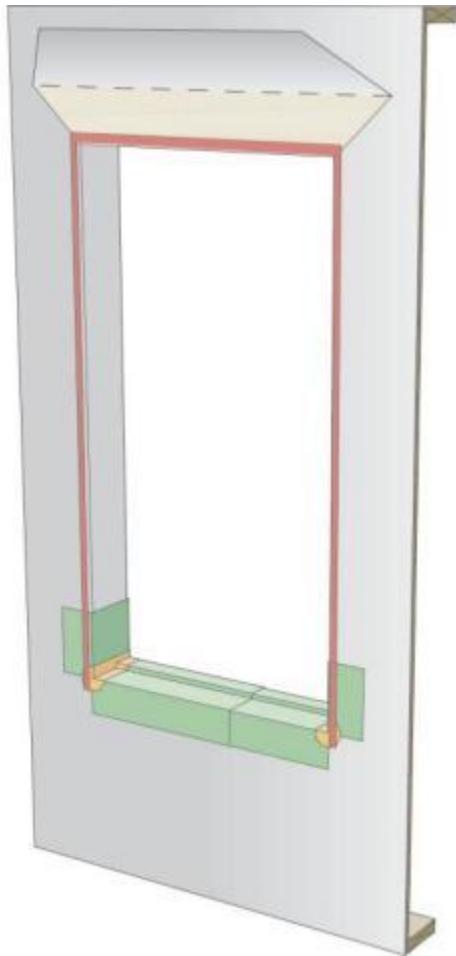


Sill Flashing

- Can use continuous or multi-piece flashing approach
- Key is integration into whole wall system



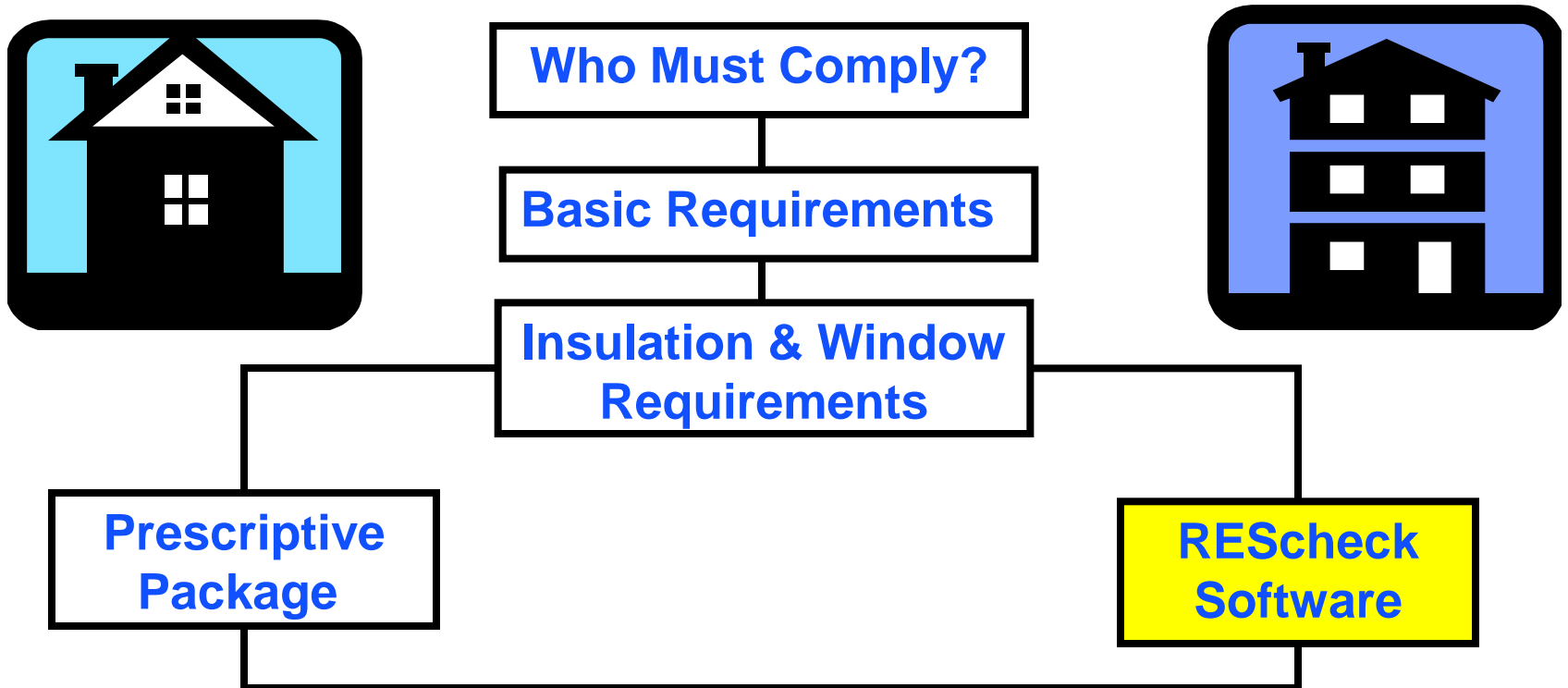
Integrate Windows



Continuous Drainage Plane



Compliance Path



U-Factor and Total UA (REScheck Approach)

- Total UA Alternative
 - Same as U-factor alternative but allows trade-offs across all envelope components
 - Approach used in REScheck software
- REScheck DOES have some Performance elements
 - Window Orientation, Area (limited)

REScheck™

Desktop Software Tools



Windows version or
Mac version

Web-Based Tools

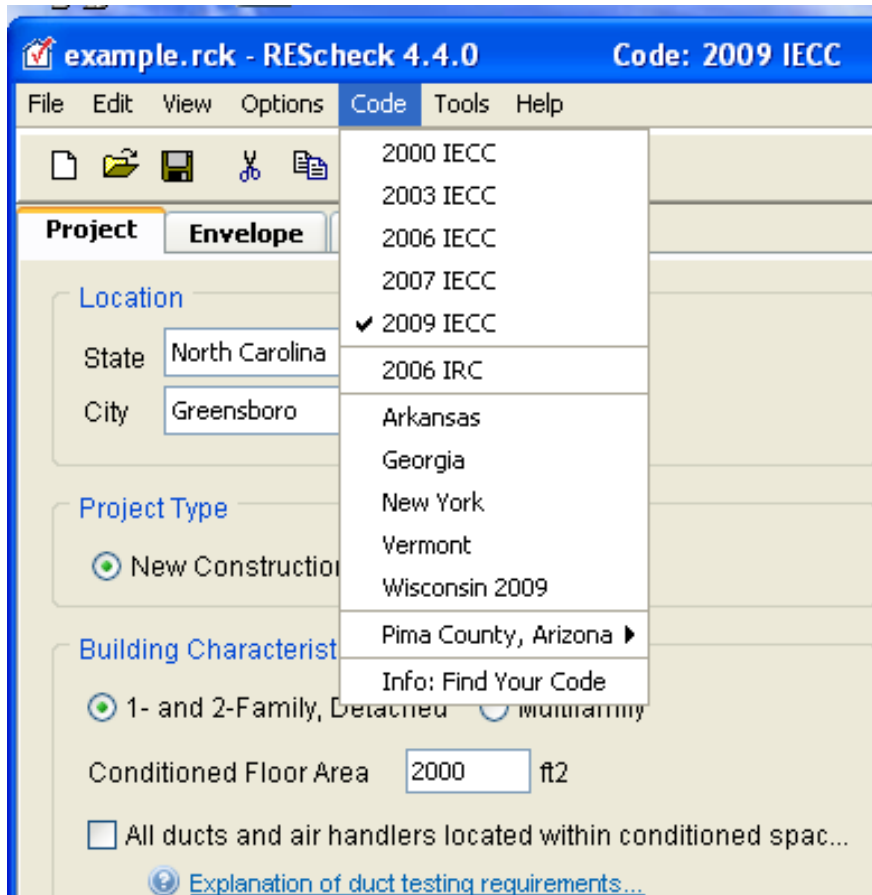


Free

REScheck Steps

- Select the Appropriate Code
- Enter Project Information
- Enter Building Components
- Enter Mechanical Equipment (optional)
- View/Print the Compliance Report
- Save the Data File and the Report

Appropriate Code



- Applicable Energy Code (Code Menu)
- Default
- Preferences

Project Information

Project Details (optional)

Title/Site/Permit | **Owner/Agent** | **Designer/Contractor**

Enter the project title, construction site, and permit information.
This information will appear on the compliance certificate.

Title:

Construction Site

Address 1:

Address 2:

City:

State:

Zip Code:

Permit

Permit #:

Permit Date:

Notes:

Previously saved project information:
1010 Construction Ave.
Greensboro, North Carolina

OK Cancel

- Project location
- Project type
- Project details for report (optional)
 - Title/Site/Permit
 - Owner/Agent
 - Designer/Contractor
 - Notes

Compliance

- UA
 - “Max UA”
 - “Your UA”
- 2009 IECC-based projects
 - New Construction
 - Must enter a roof, walls, and floor assembly
 - Check Compliance button
 - NO High-efficiency HVAC Tradeoff
 - Performance alternative if UA calculation fails

Screen Operations

example.rck - REScheck 4.4.0 Code: 2009 IECC

File Edit View Options Code Tools Help

Project Envelope Mechanical

Ceiling Skylight Wall Window Door Basement Floor Crawl Wall

	Component	Assembly	Gross Area or Slab Perimeter		Cavity Insulation R-Value	Continuous Insulation R-Value	U-Factor	UA	SHGC	Depth of Insulation (ft)
Building										
1	Ceiling 1	Flat Ceiling or Scissor Truss	729	ft2	38.0	0.0	0.03	22		
2	Ceiling 2	Flat Ceiling or Scissor Truss	592	ft2	30.0	0.0	0.035	21		
3	Wall 1	Wood Frame, 16" o.c.	1647	ft2	13.0	6.0	0.053	71		
4	Door 1	Glass	84	ft2			0.31	26	0.30	
5	Window 1	Vinyl Frame, Double Pane...	204	ft2			0.32	65	0.40	
6	Door 2	Solid	20	ft2			0.35	7		
7	Wall 2	Wood Frame, 16" o.c.	276	ft2	13.0	0.0	0.082	21		
8	Door 3	Solid	18	ft2			0.35	6		
9	Floor 1	All-Wood Joist/Truss, Ov...	938	ft2	19.0	0.0	0.047	44		
10	Floor 2	All-Wood Joist/Truss, Ov...	32	ft2	30.0	0.0	0.033	1		
11	Floor 3	Slab-On-Grade:Unheated	82	ft		8.0	0.779	64		2.0

Compliance Bar
Status Bar

Passes

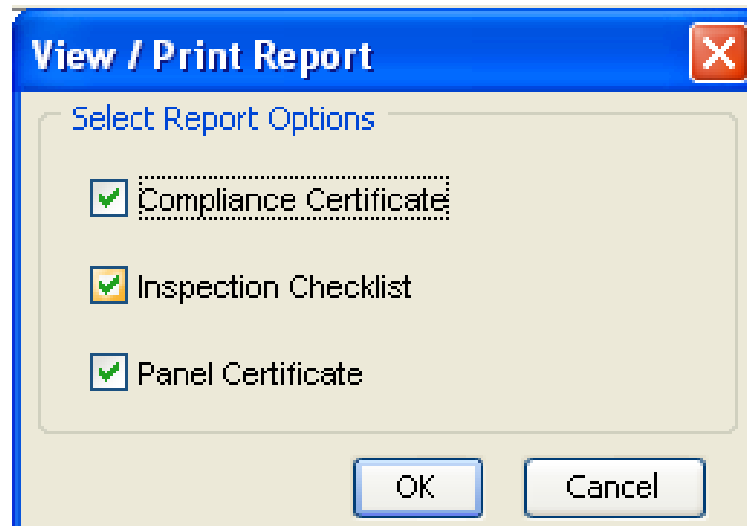
11.5 % Better Than Code

Compliance Method: UA Trade-Off Max. UA 393 Your UA 348

Click the Assembly fields to display a list of assembly choices.

Compliance Reports

- Project complies
- View/Print Report



Compliance Certificate

Project Information



REScheck Software Version 4.4.0

Compliance Certificate

Project Title: North Meadows Development

Energy Code: **2009 IECC**
Location: **Greensboro, North Carolina**
Construction Type: **Single Family**
Building Orientation: **Bldg. faces 0 deg. from North**
Glazing Area Percentage: **15%**
Heating Degree Days: **3865**
Climate Zone: **4**

Construction Site:
Permit Date: 3/17/00

Owner/Agent:

Designer/Contractor:

Compliance: Passes using UA trade-off

Compliance: **11.5% Better Than Code** Maximum UA: **393** Your UA: **348**
The % Better or Worse Than Code index reflects how close to compliance the house is based on code trade-off rules.
It DOES NOT provide an estimate of energy use or cost relative to a minimum-code home.

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Glazing or Door U-Factor	UA
Ceiling 1: Flat Ceiling or Scissor Truss	729	38.0	0.0		22
Ceiling 2: Flat Ceiling or Scissor Truss	592	30.0	0.0		21
Wall 1: Wood Frame, 16" o.c. Orientation: Unspecified	1647	13.0	6.0		71
Door 1: Glass SHGC: 0.30 Orientation: Unspecified	84			0.310	26
Window 1: Vinyl Frame, Double Pane with Low-E SHGC: 0.40 Orientation: Unspecified	204			0.320	65
Door 2: Solid Orientation: Unspecified	20			0.350	7
Wall 2: Wood Frame, 16" o.c. Orientation: Unspecified	276	13.0	0.0		21
Door 3: Solid Orientation: Unspecified	18			0.350	6
Floor 1: All-Wood Joist/Truss, Over Unconditioned Space	938	19.0	0.0		44
Floor 2: All-Wood Joist/Truss, Over Outside Air	32	30.0	0.0		1
Floor 3: Slab-On-Grade/Unheated Insulation depth: 2.0"	82		8.0		64

Compliance Statement: The proposed building design described here is consistent with the building plans, specifications, and other calculations submitted with the permit application. The proposed building has been designed to meet the 2009 IECC requirements in REScheck Version 4.4.0 and to comply with the mandatory requirements listed in the REScheck Inspection Checklist.

Name - Title

Signature

Date

Project Notes:

Previously saved project information:
1010 Construction Ave.
Greensboro, North Carolina
Guilford County
Careful Builders, Inc.

Building Components

Compliance Statement

Project Notes

Inspection Checklist



REScheck Software Version 4.4.0
Inspection Checklist

Ceilings:

- ☐ Ceiling 1: Flat Ceiling or Scissor Truss, R-38.0 cavity insulation

Comments: _____

- ☐ Ceiling 2: Flat Ceiling or Scissor Truss, R-30.0 cavity insulation

Comments: _____

Above-Grade Walls:

- ☐ Wall 1: Wood Frame, 16" o.c., R-13.0 cavity + R-6.0 continuous insulation

Continuous insulation specified for this above-grade wall has consistent R-value rating across full area of the wall.

Comments: _____

- ☐ Wall 2: Wood Frame, 16" o.c., R-13.0 cavity insulation

Comments: _____

Windows:

- ☐ Window 1: Vinyl Frame, Double Pane with Low-E, U-factor: 0.320

For windows without labeled U-factors, describe features:

#Panes _____ Frame Type _____ Thermal Break? _____ Yes _____ No

Comments: _____

Doors:

- ☐ Door 1: Glass, U-factor: 0.310

Comments: _____

- ☐ Door 2: Solid, U-factor: 0.350

Comments: _____

- ☐ Door 3: Solid, U-factor: 0.350

Comments: _____

Floors:

- ☐ Floor 1: All-Wood Joist/Truss, Over Unconditioned Space, R-19.0 cavity insulation

Comments: _____

Floor insulation is installed in permanent contact with the underside of the subfloor decking.

- ☐ Floor 2: All-Wood Joist/Truss, Over Outside Air, R-30.0 cavity insulation

Comments: _____

Floor insulation is installed in permanent contact with the underside of the subfloor decking.

- ☐ Floor 3: Slab-On-Grade-Unheated, 2.0' insulation depth, R-8.0 continuous insulation

Comments: _____

Slab insulation extends down from the top of the slab to at least 2.0 ft. OR down to at least the bottom of the slab then horizontally for a total distance of 2.0 ft.

Air Leakage:

- ☐ Joints (including rim joist junctions), attic access openings, penetrations, and all other such openings in the building envelope that are sources of air leakage are sealed with caulk, gasketed, weatherstripped or otherwise sealed with an air barrier material, suitable film or solid material.
- ☐ Air barrier and sealing exists on common walls between dwelling units, on exterior walls behind tubs/showers, and in openings between window/door jambs and framing.
- ☐ Recessed lights in the building thermal envelope are 1) type IC rated and ASTM E283 labeled and 2) sealed with a gasket or caulk between the housing and the interior wall or ceiling covering.
- ☐ Access doors separating conditioned from unconditioned space are weather-stripped and insulated (without insulation compression or damage) to at least the level of insulation on the surrounding surfaces. Where loose fill insulation exists, a baffle or retainer is installed to maintain insulation application.

- Mandatory requirements
- Code presumes these requirements are met
- First of three pages

Panel Certificate

Under 2009 IECC-
based codes, panel
certificate option



2009 IECC Energy Efficiency Certificate

Insulation Rating	R-Value
Ceiling / Roof	38.00
Wall	13.00
Floor / Foundation	11.00
Ductwork (unconditioned spaces):	_____

Glass & Door Rating	U-Factor	SHGC
Window	0.35	0.40
Door	0.25	NA

Heating & Cooling Equipment	Efficiency
Heating System: _____	_____
Cooling System: _____	_____
Water Heater: _____	_____

Name: _____ Date: _____

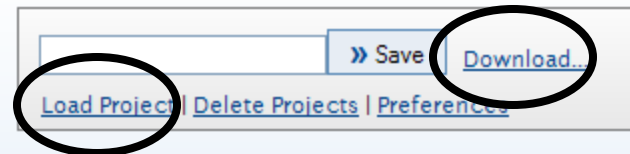
Comments:

Files

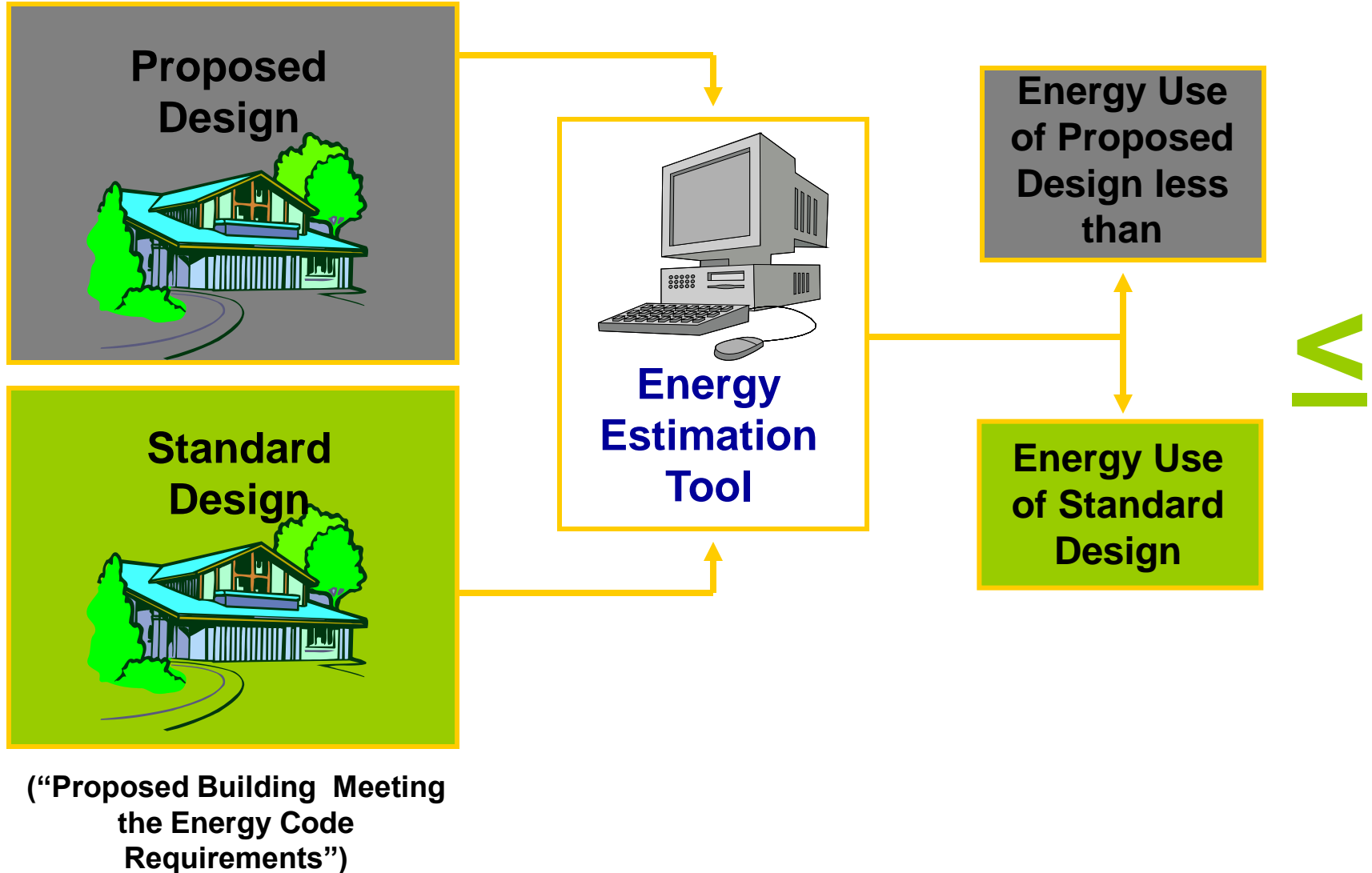
- Data (*File>Save*) ⇒
- Report (*File>Save Report*) ⇒
- Exchange



REScheck-Web has been updated!
[Learn what's new.](#) (September 2008)



Performance Approach



Simulated Performance

- Requires computer software with specified capabilities (local official may approve other tools)
- Includes both envelope and orientation
- Allows greatest flexibility. Credits features such as:
 - Tight building envelope
 - Tight ducts (must be leak tested) or hydronic systems
 - Exterior shading, favorable orientation, thermal mass, SHGC, etc.
- Section 405 specifies “ground rules”
 - These will generally be “hidden” in compliance software calculation algorithms
 - Very similar ground rules are used in new home federal tax credits and ENERGY STAR Home guidelines

Simulated Performance Alternative *(Section 405)*

- Analysis includes
 - Proposed R-values/U-factors
 - Solar Gain
 - Various duct and distribution efficiencies
 - Service Water Heating
 - Infiltration
 - Duct tightness
 - Orientation
- Mandatory requirements necessary
 - Sections 401, 402.4, 402.5 and 403

Implementation Challenges

Codes are not being well Implemented:

- *Training of Trades, Builders and Code Officials*
- *Requirements unclear and how to build them into buildings*
- *Compliance Low*
- *We're NOT getting the projected energy savings OR building better buildings*

Resources



U.S. Department of Energy
Energy Efficiency and Renewable Energy
Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable



EERE Home

Building Energy Codes Program



About the Program



DOE's Building Energy Codes Program is an information resource on national model energy codes. We work with other government agencies, state and local jurisdictions, national code organizations, and industry to promote stronger building energy codes and help states adopt, implement, and enforce those codes.

The Program recognizes that energy codes maximize energy efficiency only when they are fully embraced by users and supported through education, implementation, and enforcement.

Compliance Tools

- Residential (REScheck)
- Commercial (COMcheck)
- On-line Compliance Tools
- Federal Building Codes - Commercial

Training/Education

- Residential Training
- Commercial Training
- Events Calendar
- Energy Codes Glossary
- Annual Workshop

Implementation Tools

- Resource Center
- DOE 2004 Proposals
- DOE Determinations
- DOE Assistance
- Resource Materials
- Status of State Energy Codes
- Setting the Standard

Technical Support

- Code Notes

Related Links

[XML](#) [RSS](#)
Receive news via our RSS feed

Free Software




REScheck
[REScheck](#), [REScheck-Web](#), [REScheck Package Generator](#)



COMcheck
[COMcheck](#), [COMcheck-Web](#), [COMcheck Package Generator](#)

Technical Support



Resource Center
[Resource Center](#)



Ask an Energy Codes Expert
[Ask an Expert](#)

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[Search Help >](#) [More Search Options >](#)

[Site Map](#)
Need Help? -
[Ask an Energy Codes Expert](#)
(Software Tools and Energy Codes Assistance)

[EERE Information Center](#)
 [Printer Friendly Format](#)

NEWS

Notice Requesting Public Input on Further Analysis Related to Wall Insulation Requirements for Residential Buildings in the IECC and Other Potential Code Change Proposals

Building Technologies State Energy Outreach and Deployment State Energy Program (SEP) Special Projects Grant Solicitation [Now Open](#)

Statement of the Department of Energy - State Energy Code Criteria for Residential AC and HP

[2005 ICC Final Action Hearings](#)

LIVE WEBCAST Residential Requirements of the 2006 International Energy Conservation Code (IECC) April 20, 2006 Register Now.

[www.energycodes.gov](#)
techsupport@becp.pnl.gov



5



11

5

10

10

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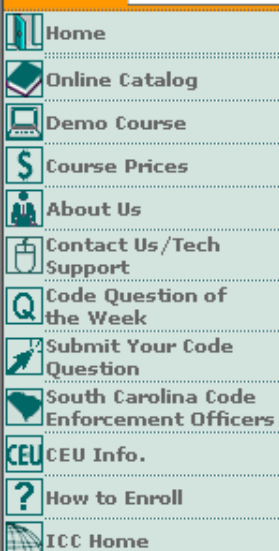
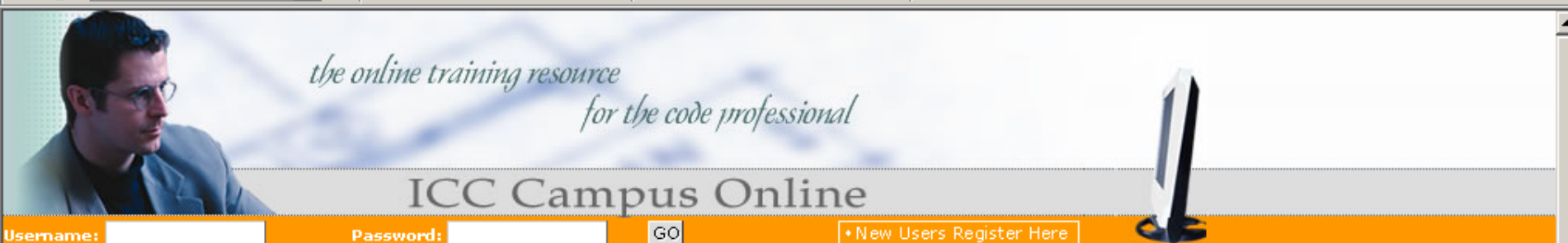
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Go Links



Welcome!

The International Code Council is setting the Standard for Building Safety. Courses on the campus are available in the following areas:

- Regulatory and Compliance
- Personal Development
- Community Safety
- Management Skills
- Accounting and Finance
- Office Skills
- Desktop Application



www.icccampus.org

ICC Certification Exams will change to the 2006 editions of the codes beginning on January 1, 2007. Currently, 2003 editions of the Certification Examination Practice Courses are available. If you are practicing for the 2006 exams, the 2006 practice courses will begin to become available in late November, 2006.



On-line Training Center

[HOME](#)[CONTACT US](#)[HELP](#)[Building Codes](#)[Building Envelope](#)[HVAC](#)[Water Heating](#)[Building Science](#)[Renewables](#)[Technology Solutions](#)[RESIDENTIAL](#)[NON-RESIDENTIAL](#)

Welcome to the Colorado Code College Online Training Website.

This website training provides video content in support of OEMC's mission to provide current training on a variety of building code, energy efficiency and related building science issues to help guide the design and construction of efficient, durable and sustainable buildings in Colorado. While Colorado does not have a mandatory Energy Code, there has been mandatory adoption of energy codes in many large jurisdictions such as Denver and Fort Collins.

Code College is divided into main topics for ease of navigation amongst subjects such as the Energy Codes, Building Performance Issues, HVAC, Building Envelope and the like. The training video "Resource" modules are found under these and other sub-categories. Along with the training videos, you will also find additional links to local and state resources.

The Colorado Office of Energy Management and Conservation hopes this website is valuable to you, and encourages your feedback for its

Welcome

To view multimedia materials on this site, latest **Windows Media player** is required.

Click on "**Help**" for more information.

National Level - National Model Building Energy Code & Standards

COMMERCIAL

Standard 90.1 2010; 30 % Target (Achieved about 25%)

Currently:

- Standard 189.1 (Completed 2009)
- International Green Construction Code (IgCC) 2nd draft 11/4/2010
- LEED, Global Green, Advanced Energy Design Guides, Core Performance, ENERGY STAR

National Level - National Model Building Energy Code & Standards

RESIDENTIAL

*International Energy Conservation Code; 30%
improvement underway-2012 IECC*

Currently,

- 2009 IECC (several significant new provisions to boost energy efficiency 15% on average nationally for 2012 IECC)
- ENERGY STAR
- LEED RESIDENTIAL, BUILDING AMERICA
ICC 700, Build it Green

ICC 700 National Green Building Standard

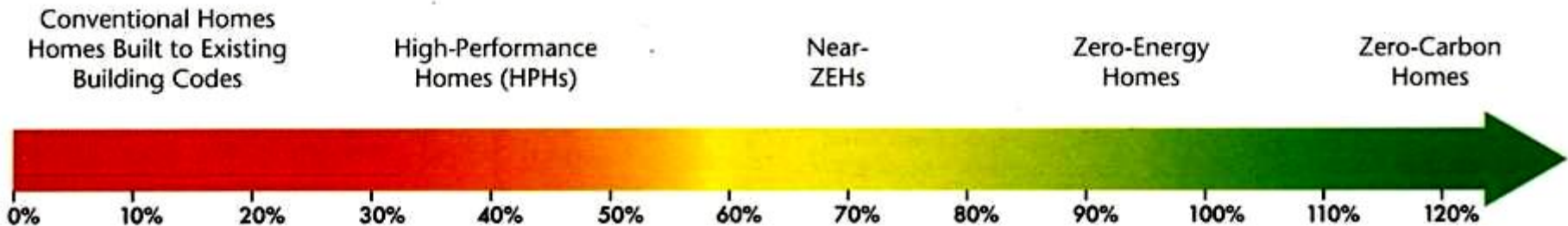
Table 303
Threshold Point Ratings for Green Buildings

Green Building Categories			Performance Level Points ^{(1) (2)}			
			BRONZE	SILVER	GOLD	EMERALD
1.	Chapter 5	Lot Design, Preparation, and Development	39	66	93	119
2.	Chapter 6	Resource Efficiency	45	79	113	146
3.	Chapter 7	Energy Efficiency	30	60	100	120
4.	Chapter 8	Water Efficiency	14	26	41	60
5.	Chapter 9	Indoor Environmental Quality	36	65	100	140
6.	Chapter 10	Operation, Maintenance, and Building Owner Education	8	10	11	12
7.		Additional Points from any category	50	100	100	100
Total Points:			222	406	558	697

- (1) In addition to the threshold number of points in each category, all mandatory provisions of each category shall be implemented.
- (2) For dwelling units greater than 4,000 square feet (372 m²), the number of points in Category 7 (Additional Points from any category) shall be increased in accordance with Section 601.1. The "Total Points" shall be increased by the same number of points.

New Housing Energy Continuum

Percentage of Projected Energy Savings



Conventional homes

Complies with existing energy codes with 100% reliance on utility supplied energy.

High performance homes

Saves 30 to 50% of utility energy costs over conventional homes using efficiency and renewable energy technologies.

Near-zero energy homes

Saves 60 to 90% utility energy cost over conventional homes.

Net-zero energy homes

Produces as much energy as it uses, saving 100% utility energy costs.

Zero-carbon homes

Produces more energy than it uses and exporting at least 20% electricity to the grid.

Courtesy of Anthony Floyd City of Scottsdale AZ

Conclusions

- National, State and Local governments are paying attention to energy codes.
- Increased federal funding toward energy codes.
- Governor assurance letters included energy code provision to have 90% compliance with the 2009 IECC by 2017
- Energy codes are a critical part of building design.

Thank You!

Kevin Powell

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Bethesda, MD 20814

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www.sra.com

Building Codes Assistance Project

1850 M Street, Suite 600

Washington, D.C. 20036

www.bcap-ocean.org